

September 14, 1973

THIS ISSUE CONTAINS:

HS-013026-HS-013095

HS-800 782; 835; 837;

844; 845; 854; 867; 871

HS-820 241; 265

U.S. Department of
Transportation
National Highway
Traffic Safety
Administration



*Shelve in stacks
S.B.T.*

Highway Safety Literature

...A SEMI-MONTHLY ABSTRACT JOURNAL

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A document containing several articles is announced as complete volume under an HS number referring to it as a whole. Entries for individual articles are listed under their own HS numbers.

SAMPLE ENTRIES

JOURNAL ENTRY

Title of Document { **SYNTHESIS OF CASE LAW JURISPRUDENCE RELATING TO WET-WEATHER HIGHWAY CONDITIONS**

Journal Citation → Highway Research Record n 376 p29-36 (1971)

Author(s) → D.C. Oliver 1971

Search Terms { Descriptors: *Liability, *Negligence, *Accident responsibility, *Legal responsibility, *Wet road conditions, *Court decisions, *State government, *Skidding accidents, *Warning signs, *Highway maintenance, *Litigation, *Icy road conditions,

Abstract { The extant case law on legal liability for accidents occurring on icy and wet highways has established three central areas and one subarea in the jurisprudence of maintenance liability. These areas are compliance with general duties in order to escape liability; damages resulting from noncompliance (negligence); contributory negligence as a bar to recovery; and advisory signing as a technique in meeting general duties. Court decisions covering these four areas are presented.

NHTSA Accession Number → HS-012 289

*Subject heading in Subject Index

CONTRACT REPORT

EQUIPMENT AND PROCEDURES FOR MEASURING GLARE FOR MOTOR VEHICLES. FINAL REPORT

Corporate author → Teledyne Brown Engineering

Availability → N. E. Chatterton J. D. Hayes E. W. George 1972 102p

Contract DOT-HS-089-1-139

NTIS

Descriptors: *Glare, *Glare reduction, *Visual perception, *Photometers, *Luminance, *Hydraulic equipment, *Central vision, *Field of view, *Backgrounds, *Contrast, *Light conditions, *Brightness, *Test facilities, *Test equipment, *Vehicle safety standards, *Simulators, *Light, *Reflectance, *Measuring instruments,

A procedure and description of equipment for measuring glare from a driver's own vehicle are presented. The procedures are based on a disability glare theory as applied to foveal vision. Two pieces of apparatus were constructed to provide the measurement capability. One of them simulates diffuse sky glare and the other simulates direct solar glare. Methods of combining data from these measurements are presented along with scaling laws selected to provide a value for glare as it would be under natural daylight conditions. A standard for allowable glare levels from the vehicle is developed which is independent of the measurement procedure. Test results from a passenger car are presented and compared with this standard. Recommendations for improvements to the

*Accident costs, *Economic analysis, *Economic factors, *Life value, *Damage costs, *Medical costs, *Earning capacity, *Income, *Estimation, *Sociological factors, *National Safety Council, *National Hwy. Traf. Safety Administration,

Recently, the National Highway Traffic Safety Administration (NHTSA) published an estimate of \$46 billion as the loss due to vehicle accidents in 1971. The National Safety Council's (NSC) estimate was \$15.8 billion. The two cost estimating procedures are compared and an attempt is made to touch upon major dissimilarities between the NSC and NHTSA procedures. NHTSA attempts to measure the total societal costs of vehicle accidents and translates all inconvenience and hardship associated with vehicle accidents into dollars and cents equivalents. The NHTSA estimate includes dollar allowances for pain and suffering; community loss of the services of a killed or disabled person; and the loss of the value of the casualty victim's household duties. NSC, on the other hand, attempts to measure the real dollars lost as the result of accidents. NSC's estimate includes dollars that had to be spent as the result of the accident and dollar income that would not be received due to death, temporary inability to work, or permanent lessened ability to work.

HS-013 077

1A. Emergency Services

EMERGENCY MEDICAL SERVICES: WHERE WE ARE; WHAT WE NEED

V2 N2

Signal 99 v2 n2 p2-6

*Emergency medical services, *North Carolina, *Ambulances, *Ambulance personnel, *Radios, *Ambulance personnel training, *Ambulance laws, *State action, *State planning, *Frequencies, *Passenger compartments, *Ambulance design, *Time factors,

North Carolina's emergency medical services are evaluated and needs and recommendations are presented. Emphasis is placed on increasing the number of service units and upgrading existing units; coordination and centralized planning, funding, and regulation of emergency medical services; reducing emergency vehicle response time; increasing the number of well-trained ambulance personnel; patient compartment minimum space requirements; and improving two-way radio systems with a single statewide frequency for ambulance and hospital communications.

HS-013 040

1B. Injuries

EVALUATING HEAD PROTECTING DEVICES

Royal Industries
J. H. King

*Head impact, *Head impact tolerances, *Headmet tests, *Head forms, *Cadavers in testing, *Helmet standards, *Helmet impact tests, *Swing tests, *Severity indexes,

Head injury (primarily concussion) is linked with impact durations as well as forces. Rotational as well as translational acceleration influences head injury and is an injury mechanism in itself. Helmet testing standards are discussed, and three helmet test methods are outlined, including: use of a rigid headform with a moving impact anvil with the head protecting device (HPD) attached to the headform; use of a rigid base anvil with a moving headform with the HPD attached to the headform or the anvil; and use of a moving impact anvil with a swing away type headform with the HPD attached to the headform. The swing away method introduces a known path of rotation. Pressure distribution of the impact is often overlooked as a cause of skull fracture. A test for evaluating shock absorbing characteristics of playing surfaces is also outlined.

HS-013 028

CRASHWORTHINESS--IN PERSPECTIVE

General Motors Corp.

For primary bibliographic entry see Fld. 5D.

HS-013 048

1C. Investigation And Records

SKID ACCIDENT ANALYSIS STUDY BASED ON POLICE REPORTS

Statens Trafiksäkerhetsverk (Sweden)
L. E. Samuelsson H. Norin N. Bohlin G. Ljungstrom O.
Nordstrom 2-01

Rept. on phase 1 of the Swedish Experimental Safety Vehicle Program, Steerability During Emergency Braking .
Corporate author

*Skidding accidents, *Accident analysis, *Wheel locking caused accidents, *Accident investigation, *Police reports, *Sweden, *Accident factors, *Accident types, *Accident statistics, *Accident avoidance, *Coding systems, *Steering, *Vehicle control, *Road conditions, *Highway characteristics,

All police reports concerning car accidents during 1971 in Sweden's Alingsås-Boras police district were studied and accidents where locked wheels were reported were analyzed to aid in determining: typical accident situations where steerability during braking would have prevented or reduced the consequences of an accident; the proportion of the total number of accidents in which locked wheels are a factor; and the need of steering capability during emergency braking. Of the 1,603 reported accidents, 168 (10.5%) were locked wheel accidents. Accident statistics and descriptions of the most frequent types of locked wheel accidents are presented. The possibility of avoiding the accident by using the steering wheel, if the vehicle had been equipped with an antiskid device, was determined by the investigator's subjective judgment and termed prevention. Good prevention was predicted for 70.8% of the accidents, and in 40% of the locked wheel accidents, the driver attempted to steer when the prevention was good. The coding system used in processing the accident data is included.

Field 1—ACCIDENTS

Group 1C—Investigation And Records

HS-013 030

SKID ACCIDENT ANALYSIS STUDY BASED ON INTERVIEWS

Statens Trafiksäkerhetsverk (Sweden)
F. Johansson L. Sunestedt N. Bohlin G. Ljungstrom O. Nordstrom
2-02

Rept. on phase 1 of the Swedish Experimental Safety Program,
Stability During Emergency Braking .
Corporate author

*Skidding accidents, *Wheel locking caused accidents, *Accident analysis, *Questionnaires Accident factors, *Road conditions, *Highway characteristics, *Accident avoidance, *Accident statistics, *Braking, *Steering, *Interviews, *Driver behavior, *Driver age, *Driver experience, *Driver mileage,

Interviews with the drivers of company cars at SAAB-Scania, Volvo, and all employees at the Swedish Road Research Institute were conducted to clarify types of accidents/incidents involving brake application with locked wheels. Of the 477 people interviewed, 372 cases were relevant. Accident data concerning the driver's behavior, accident severity, road conditions and highway characteristics of the accident location, vehicle movement, vehicle type, tire type, tire condition, number of occupants, and driver age and experience are presented. The possibility of avoiding an accident by using the steering wheel, if the vehicle had been equipped with an antiskid device, was determined by the driver's subjective judgement to be good in 70.2% of the cases. This was termed prevention. In 50% of the locked wheel accidents, the driver attempted to steer when prevention was good. Questionnaires used in the survey are included.

HS-013 031

SKID ACCIDENT ANALYSIS. SUMMARY REPORT

Statens Trafiksäkerhetsverk (Sweden)
N. Bohlin G. Ljungstrom O. Nordstrom 2-03
Rept. on phase 1 of the Swedish Experimental Safety Vehicle Program, Stability During Emergency Braking .
Corporate author

*Wheel locking caused accidents, *Skidding accidents, *Reviews, *Accident analysis, *Accident rates, *Accident studies, *Accident types, *Road conditions,

Findings of the Skid Accident Analysis Study Based on Police Reports and the Skid Accident Analysis Study Based on Interviews are summarized and compared. The results of a literature survey conducted to find more information about locked wheel accidents are presented. Approximately 50 references were received and analyzed, but only three reports gave information of value for this work. The literature survey indicated 15% as an average of locked wheel accidents.

HS-013 032

HIGHWAY ACCIDENT REPORT--RUNOFF AND OVERTURN OF INTERCITY BUS ON INTERSTATE 95, RICHMOND, VIRGINIA, SEPTEMBER 3, 1972

National Transp. Safety Board
NTSB-HAR-73-2; SS-H-
Corporate author

HSL 73, No. 17

*Accident case reports, *Accident analysis, *Driver fatigue caused accidents, *Bus accidents, *Ran off road accidents, *Rollover accidents, *Guardrails, *Median barriers, *Fatality causes, *Injury causes, *Ejection through side windows, *Accident location, *Richmond (Virginia), *Bus drivers, *Impact angle, *Vehicle kinematics, *Occupant kinematics, *Passenger injuries, *Crashworthiness, *Barrier deformation,

At about 2:20 a.m. a southbound intercity bus carrying 42 passengers climbed a raised median on a gradual curve to the right, struck and displaced 220 feet of median barrier rail, and returned to the southbound lanes. The bus then crossed the southbound lanes, glanced off the west-side guardrail, vaulted, and overturned on a steep embankment off the highway. Three passengers were killed, and all other passengers were injured. The probable cause of this crash was that the busdriver failed to stay awake and steer the bus, which permitted the bus to encounter the median, resulting in loss of vehicle control and in overturn of the bus on a guardrail inadequate to resist a shallow-angle impact. The absence of passenger restraints, which permitted the tumbling and ejection of passengers, contributed to fatalities and injuries. Undesired opening of side windows subjected to rollover-induced stresses contributed to ejections.

HS-013 035

HOW REAL-WORLD CRASHES ARE INCREASING AIR BAG ACCEPTANCE

For primary bibliographic entry see Fld. 5N.
HS-013 076

TINTED WINDSHIELDS DON'T INCREASE ACCIDENT RISK

V81 N5
A. M. Gittelsohn
Automotive Engineering v81 n5 p50-3

Tinted windshields, *Accident risks, *Accident analysis, *Statistical analysis, *Accident factors, *Heat absorbing glass, *Light transmission, *Chi square test, *Night visibility, *Day vs night accidents, *Driver age, *Time of accidents, *Vehicle safety standards,

The proposed NHTSA standard concerning light transmittance would require at least 80% light transmittance in the primary viewing zone of the driver, thus effectively ruling out the use of tinted or heat absorbing glass in windshields. However, a statistical analysis of 6,071 accidents indicates that windshield with tinted or heat absorbing glass do not contribute to accident risk. The study also indicated that: the observed proportions of nighttime and daytime accidents involving cars equipped with heat absorbing glass (HA) windshields correspond closely with the proportions of vehicles equipped with HA windshields; cars with HA windshields are not involved in an excess of nighttime accidents; and older drivers using cars equipped with HA windshields do not present an increased accident risk when driving at night.

HS-013 091

MULTIDISCIPLINARY ACCIDENT INVESTIGATION. FINAL REPORT

Maryland Medical-Legal Foundation, Inc.
R. S. Fisher MMF-FR-1970
Contract FH-11-7399
Report for 29 Oct 1969-30 Nov 1970.
NTIS

*Accident investigation, *Multidisciplinary teams, *Baltimore, *Accident factors, *Accident studies, *Precrash phase, *Crash phase, *Postcrash phase, *Accident statistics, *Accident case reports, *Human factors, *Environmental factors, *Automobile accidents, *Accidents by vehicle age, *Fatalities by age, *Fatalities by sex, *Injuries by age, *Injuries by sex, *Accident types, *Accident causes, *Injuries by body area, *Injuries by seat occupation, *Restraint system usage, *Restraint system effectiveness, *Blood alcohol levels, *Single vehicle accidents, *Toxicology, *Injury causes, *Accident responsibility, *Driver intoxication, *Driver characteristics, *Psychological factors, *Vehicle design, *Vehicle safety standards, *Vehicle inspection, *Bus accidents, *Accident location, *Carbon monoxide poisoning, *Highway improvements, *Fatality causes, *Autopsies, *Driver records, *Automobile defects,

An in-depth multidisciplinary highway accident investigation was carried out during a 13 month period in the Baltimore metropolitan region and surrounding rural area. Investigations of 38 accidents included vehicular examination, accident scene visit, complete autopsy of all fatally injured victims with toxicological analysis for alcohol and a wide variety of drugs, and extensive psychosocial evaluation of many drivers. Methodology, results, and comments on current and proposed Federal Safety Standards and on periodic motor vehicle inspection, especially as they apply to the accident series, are given. Also included are special reports of two bus accidents, lower control arm failures, and a high accident highway segment. Papers prepared by members of the accident investigation team: Psychologic Factors in Single-Car Accident Fatalities; Investigation of Vehicular Carbon Monoxide Fatalities; and Assessment in Absentia—Some Approaches to the Psychological Evaluation of the Deceased are presented in the appendix.
HS-800 782

ACCIDENT INVESTIGATION TECHNICIAN INSTRUCTOR TRAINING INSTITUTE, VOL. 2. FINAL REPORT

Center for Vocational and Technical Education
R. D. Daugherty A. C. Hayes S. R. Orletsky
Contract DOT-HS-115-1-169
Report for Jul 1971-Aug 1972. Vol 1 is HS-800 824.
NTIS

*Accident investigation training, *Instructor training, *Curriculum, *Manpower utilization, *Personnel, *Transportation systems, *Professional role, *Driver identification, *Precrash phase, *Driver behavior, *Driver characteristics, *Driver skills, *Speed estimation from skidmarks, *Driver physical fitness, *Crash phase, *Postcrash phase, *Witnesses, *Vehicle characteristics, *Damage severity, *Defects, *Injury causes, *Environmental factors, *Skidmarks, *Impact angle, *Debris, *Interviews, *Evidence, *Measurement Photography, *Accident diagrams, *Accident reconstruction, *Accident causes, *Accident reports, *Accident simulation, *Program evaluation, *Driver attitudes,

This project was designed to train 75 state and local police instructors to develop lesson units and techniques for a curriculum in accident investigation. A course guide, student study guide, and instructor's lesson plans are included. The lessons cover the highway transportation system; the investigator's role; investigation planning; definitions and classifications; driver identification; examination of the driver's precrash and

fatigue, and illness; identification of driver behavior, personality, attitude, skills, and natural abilities; identification of witnesses, vehicle types, damage, vehicle defects, injury causes, environmental factors, marks on or near the road, impact angle, and debris; identification of vehicle parts with crash marks; collection of precrash and postcrash actions and reactions; interviewing; collection and preservation of evidence; relocation measurements; photography; speed estimation; field sketches; accident reconstruction, causation, and reporting; and a simulated investigation.
HS-800 845

2. HIGHWAY SAFETY

UTAH, WASATCH FRONT COUNTIES, TRAFFIC ACCIDENTS BY TYPE AND ACCIDENT RATE, 1972

Utah State Dept. of Highways

In cooperation with Federal Hwy. Administration.
Corporate author

*Accident statistics, *Utah, *Accident rates, *Accident location, *Traffic volume, *Injury statistics, *Injuries by accident type, *Property damage accidents, *Side impact collisions, *Head on collisions, *Ran off road accidents, *Rear end collisions, *Vehicle fixed object collisions, *Rollover accidents, *Fatalities,

Information on motor vehicle traffic accidents by type and rate for Federal-aid and State highways in the Wasatch Front counties (Weber, Davis, Salt Lake, and Utah) is presented. The accident rates are expressed by frequency of accidents in relation to type, time, traffic volume, and linear length. Utah State Law requires a driver involved in a motor vehicle accident resulting in the injury or death of any person, or property damage exceeding \$100, to submit a standard accident report to the State Department of Public Safety. The accident data presented were compiled from those reports.
HS-013 084

MULTIDISCIPLINARY ACCIDENT INVESTIGATION. FINAL REPORT

Maryland Medical-Legal Foundation, Inc.
For primary bibliographic entry see Fld. 1C.
HS-800 782

2. HIGHWAY SAFETY

2B. Communications

IN-VEHICLE DRIVER AID AT TRAFFIC SIGNALS

R. L. Bleyl
Sponsored by Highway Res. Board Com. on Motorist Information Systems.
Highway Research Record n414 p6-15

*Driver aid systems, *Warning system effectiveness, *Display systems, *Traffic signals, *Audio display systems, *Data analysis, *Variance analysis, *T test, *Driver performance,

A full-scale working model of a communications system was developed and employed in an empirical study to determine

Field 2—HIGHWAY SAFETY**Group 2B—Communications**

in making a smoother and safer approach to a traffic signal installation. The driver aid informed drivers that they were approaching a signalized location and gave them information about the signal indication that they would encounter on their arrivals at the traffic signal. It was determined from this analysis that the smoothness and safety of travel approaching a traffic signal installation could be improved by the use of a personal, dynamic, in-vehicle display. Even though drivers knew 1/3 mile in advance when they would be stopped by the traffic signal, they adjusted their speeds gradually and generally refused to travel at speeds that seemed to be unnaturally slow. A combination auditory and light display, activated approximately 500 ft in advance of the signal and having a personal, binary message (prepare to stop or plan to proceed), was recommended for further development.

HS-013 070

FLASH, A COOPERATIVE MOTORIST AID SYSTEM. FINAL REPORT

Airborne Instruments Lab.
B. AdlerJ. R. MartinG. W. MortonI. S. Wisepart AIL-3023-1
Contract FH-11-6416
Corporate author

*Flash Lights and Send Help Program, *Disabled vehicles, *Highway communication, *Program evaluation, *Electronic monitoring systems, *Computers, *Optical detectors, *Sign design, *Sign location, *Data processing, *Data analysis, *Field tests, *Statistical analysis, *Computerized dispatching systems, *Florida, *Consoles, *Community support, *Questionnaires, *Time factors, *Maintenance, *Maintenance reports, *Police reports, *Police traffic services, *Public opinion, *Generators, *Sign standards, *Specifications, *Design of experiments,

Flash Lights and Send Help (FLASH) was designed to test the operational feasibility of cooperative motorists using their headlights to aid distressed motorists. A 50 mile segment of Interstate Highway 4 in Florida was selected for an evaluation site. Along this section, motorists were instructed in the operation of FLASH by a series of roadside signs. The roadside equipment detects motorists' flashes and transmits a signal to the central monitor at the Florida Highway Patrol Troop Headquarters. There, all of the signals from 20 detector stations are processed and the locations of stranded motorists are displayed on a console. The evaluation program proved FLASH to be an effective motorist aid system; Effectiveness measures include empirical data from a series of controlled experiments showing that passing motorists use the system properly. The public's acceptance of FLASH was measured by questionnaires. An additional questionnaire showed that the disabled motorists had a short waiting time for service and that they were satisfied with the service received.

HS-013 079

2G. Meteorological Conditions

TRUCK NOISE—MEASUREMENTS AND CORRELATION TO INDUSTRY AND LAW ENFORCEMENT STANDARDS

McDonnell Douglas Astronautics Co.
G. Leneman

Presented at the 19th annual technical meeting of the Institute of Environmental Science and Technology, San Francisco, Calif., and

Northeast Highway, Mt. Prospect, Ill. 60056

*Vehicle noise, *Acoustic measurement, *Trucks, *Noise standards, *California, *Sound level meters, *Sound intensity, *Compliance,

The noise emitted during the operation of seven representative McDonnell Douglas Corporation (MDC) owned trucks was measured, under conditions specified by Method SAE J-366. The internal truck noises were well within the daily maximal industrial noise exposure criteria established by the Occupational Safety and Health Act. The data also indicate that the maximum external noises of turbo-supercharged diesel and gasoline trucks presently used on the open road by MDC comply with the current California vehicle noise standards for new vehicles (Section 27160 of the Vehicle Code). However, the present wording of the State of California Vehicle Code is such that one could buy or sell a vehicle which is certified to emit a noise legal by the wording of Section 27160, and be cited for excessive noise (with the same vehicle) by the wording of Section 23130.

HS-013 029

EVALUATING TRANSPORTATION CONTROLS TO REDUCE MOTOR VEHICLE EMISSIONS IN MAJOR METROPOLITAN AREAS

Institute of Public Administration
For primary bibliographic entry see Fld. 5F.
HS-013 044

PUBLIC LIABILITY FOR MOTOR VEHICLE NOISE

V7 N1
3RD, J. French
Pl-16 Speed Ground Transportation Journal v7 n1

*Vehicle noise, *Liability, *Court decisions, *Litigation, *Damage claims, *Land values, *Property values, *Compensation, *Land acquisition, *Acoustic measurement, *Sound intensity, *Highway environmental impact, *Airport location,

Unlike land bordering airports or from which a portion is taken for public highways, land which has depreciated in value from highway noise alone is not yet subject to state compensation. As the number of high speed highways increases and affected landowners demonstrate substantial impacts upon their economic well-being to the public, such claims will be heard with increasing interest by the courts. The strong case for relief presented by such claims, together with the limited class presenting such claims and the inconsistency of granting noise damages to neighbors whose property was actually taken in part by the same highway, may lead the courts to conclude that a taking of land by noise has occurred. A few states have begun acting to reduce highway noise. If these efforts fail or other states take no action, liabilities for highway noise may become immediate realities.

HS-013 050

WORLD TRANSPORTATION DEVELOPMENT: ECOLOGICAL ASPECTS

V7 N1
T. S. KhachaturovL. I. Wasilewski
P37-46 SPEED Ground Transportation Journal v7 n1

*Ecology, *Environmental factors, *Transportation problems, *Vehicle air pollution, *Air pollutants, *Air pollution effects

*Water pollution, *Traffic noise, *Aircraft noise, *Vehicle noise, *Noise control, *Land usage, *Urban areas, *Highway environmental impact, *Urban transportation,

Transport-generated changes in the ecological relations between man and the environment, including air pollution, water pollution, noise pollution, and the continuous increase in the land area under transportation routes and structures at the expense of agricultural land, zones of rest and recreation, and houses, are discussed. Highway transport is not only responsible for more air pollution than all other modes of transport but surpasses all other industries in this respect. In water pollution a substantial role is played by sea shipping and, to a lesser degree, by river transport, especially by tankers. Noise pollution is caused in its sharpest form by air transport. However, railways and all modes of urban and industrial transportation participate in creating a universal background of noise. Some solutions to the environmental problems caused by transportation are suggested.

HS-013 051

TRANSPORT POLICY ASSESSMENT: COSTS AND BENEFITS OF ENVIRONMENTAL QUALITY

V7 N1

A. M. Khan

P101-27 PEED Ground Transportation Journal v7 n1

*Environmental quality, *Transportation planning, *Environmental planning, *Benefit cost analysis, *Environmental impact statements, *Urban areas, *Air pollution, *Exhaust emissions, *Exhaust emission control, *Urban planning,

Transportation and environmental quality are interrelated through policy issues dealing with economic efficiency, physical quality of urban life, and distributional or equity aspects of the urban system. An apparent conflict exists between rate of growth in mature urban areas and environmental quality. Proper planning and control of urban growth, land development, and transportation are necessary to avoid undesirable consequences due to external economic factors. Costs and benefits of urban transportation should be studied on a disaggregated basis. An interventionist approach based on an increasing level of control over growth in mature urban areas is necessary to achieve balanced transportation policy goals. Methods of measurement and valuation of urban environmental quality are needed. The use of a relative value method is suggested for the policy assessment problem which accounts for the incorporation of efficiency and equity considerations in the assessment of policy.

HS-013 052

TRANSPORTATION NOISE AND NOISE FROM EQUIPMENT POWERED BY INTERNAL COMBUSTION ENGINES

Wyle Labs.

PB-208 660 660

Contract EPA-68-04-0046

NTIS

*Transportation noise, *Noise control, *Aircraft noise, *Engine noise, *Jet engines, *Turbofan engines, *Fan noise, *Sonic boom, *Exhaust noise, *Short takeoff aircraft, *Helicopters, *Aerodynamic noise, *Vehicle noise, *Tire noise, *Transmission noise, *Trucks, *Buses, *Rail transportation, *Ship noise, *Recreational vehicles, *Motorcycles, *Snowmobile noise, *In-

ternal combustion engines, *Environmental factors, *Noise standards, *Noise control regulations, *Acoustic measurement, *Sound intensity, *Federal role, *Automobiles, *Noise exposure, *Health hazards, *Noise tolerances, *Environmental impact statements, *Industries, *Models,

The noise characteristics as well as an estimate of current and future noise reduction potential for each major element of the transportation system and for small non-industrial internal combustion engine powered devices are presented. The impact of transportation noise on the total noise environment was assessed. The analysis showed that approximately 22 to 44 million people have lost part of the utility of their dwellings and yards due to noise pollution from traffic and aircraft, and an even larger number of people are frequently subjected to intermittent speech interferences and annoyance from transportation noise sources. Some of these people, and others, are also exposed to potentially hazardous noise, when operating or riding in noisy devices. Recommendations are made for further action to reduce the overall noise impact of the sources considered.

HS-013 053

ATMOSPHERIC POLLUTION FROM VEHICLE EMISSIONS; MEASUREMENTS IN READING 1971

Transport and Road Res. Lab. (England)

D. M. Colwill TRRL-LR-541

Corporate author

*Exhaust emission measurement, *Air pollution, *Traffic density, *Traffic flow, *Meteorological data, *Reading (England), *Carbon monoxide, *Hydrocarbons, *Nitrogen oxides, *Sulfur dioxide, *Lead, *Smoke, *Oxidizers, *Summer, *Winter,

Carbon monoxide, hydrocarbon, nitrogen oxides, sulphur dioxide, lead, and smoke concentrations were monitored at the side of a heavily traveled road and a site remote from traffic in Reading, England, during a summer and a winter period of 1971 in order to observe the contribution of motor vehicles to pollutant levels in an urban area. Traffic was counted at the roadside site and climatic conditions were also recorded.

HS-013 092

NOISE MECHANISMS IN THE INFLATION OF THE AUTOMOTIVE SAFETY AIR BAG

General Motors Corp.

For primary bibliographic entry see Fld. 5N.

HS-013 094

URBAN NOISE LEGISLATION

Chicago Dept. of Environmental Control

C. Caccavari SAE-720902

Presented at National Commercial Vehicle Engineering and Operations Meeting, Fort Wayne, 9-12 Oct 1972.

SAE

*Transportation noise, *Urban areas, *Noise control regulations, *Local government, *Chicago, *Federal role, *Federal control, *Noise sources, *Trucks, *Rapid transit systems, *Railroads,

The main urban noise problem is transportation noise caused primarily by trucks, motorcycles, automobiles, mass transportation systems, and railroads. Current noise regulations in Chicago are reviewed. Noise regulations should be written to

Field 2—HIGHWAY SAFETY

Group 2G—Meteorological Conditions

grant immediate relief, to provide a stepped reduction, and to insure longrange planning for new methods in controlling urban noise. Effective noise control can only be accomplished through a cooperative federal, state, and local effort, with support from manufacturers and citizens.
HS-013 095

2I. Traffic Control

EVALUATING TRANSPORTATION CONTROLS TO REDUCE MOTOR VEHICLE EMISSIONS IN MAJOR METROPOLITAN AREAS

Institute of Public Administration
For primary bibliographic entry see Fld. 5F.
HS-013 044

EVALUATING TRANSPORTATION CONTROLS TO REDUCE MOTOR VEHICLE EMISSIONS IN MAJOR METROPOLITAN AREAS

Institute of Public Administration
For primary bibliographic entry see Fld. 5F.
HS-013 044

LONGITUDINAL TRAFFIC CONTROL BY INFRARED SENSING

J. Treiterer
Highway Research Record n421 p78-84

*Traffic control, *Infrared scanning, *Traffic flow, *Remote sensing, *Vehicle detectors Car following, *Vehicle spacing, *Traffic density, *Accident prevention, *Freeway driving, *Traffic volume, *Coding systems,

An infrared source-sensor prototype was tested in freeway driving, and a self-contained infrared remote-sensing system was studied to improve traffic flow. Because a car-following control system must be restricted to vehicles in the same lane, the target identification problem in freeway traffic was researched. Present information provided by traffic signs can be improved by infrared sensing for vehicle spacing and by lane coding for continuous driver information and proper target identification. The source-sensor system has the disadvantage that all vehicles must be instrumented to make up an effective sensing system. The self-contained system can be introduced by leaving it to the individual driver whether he wants to buy equipment providing safer and easier driving. If all vehicles were joined in an infrared longitudinal control system, traffic capacity could increase to about 4,000 vehicles/lane/hour at 40 mph on urban freeways.
HS-013 046

IN-VEHICLE DRIVER AID AT TRAFFIC SIGNALS

For primary bibliographic entry see Fld. 2B.
HS-013 070

RECOGNITION OF TRAFFIC-CONTROL SIGNS

R. E. DewarH. A. Swanson
Sponsored by Highway Res. Board Com. on Motorist Information Systems.
Highway Research Record n414 p16-23

*Traffic signs, *International signs, *Sign uniformity, *Symbols, *Sign recognition, *Driver performance, *Sign effectiveness, *Sign design, *Test volunteers, *Age factor in driving, *T test, *Chi square test, *Statistical analysis, *Pattern recognition, *Traffic law violations, *Alberta, *Tachistoscopes,

A review of the literature with respect to symbols versus word messages on traffic signs, symbolization philosophies and recognition problems, and education of motorists about meanings of symbols is presented. A laboratory experiment was conducted to determine the ability of subjects to recognize selected turn-restriction signs under conditions of short exposure. The traffic signs were varied by types of turn restrictions and mode of indicating the sign message, (words, positive and negative symbols, and combinations of these). The experiment made use of a projection tachistoscope. Subjects varied in age, driving skill, and experience. A field study compared the effectiveness of both negative and positive symbols. The effectiveness was measured in relation to the number of motorist disregarding the turn-restriction sign.
HS-013 071

CRITERIA FOR DESIGN AND DEPLOYMENT OF ADVANCED GRAPHIC GUIDE SIGNS

J. W. Eberhard
Sponsored by Highway Res. Board Com. on Motorist Information Systems.
Highway Research Record n414 p24-9

*Traffic signs, *Highway signs, *Sign design, *Symbols, *Sign location, *Sign effectiveness, *Driver performance, *Sign recognition, *Pattern recognition, *Interchanges, *Laboratory tests, *Tachistoscopes, *Sign tests, *Exits, *Lane drops,

The graphic sign characteristics that best communicated roadway-interchange and route-guidance information to the driver were determined. Emphasis was placed on developing laboratory sign testing procedures for determining the effectiveness of signing alternatives and developing analytical techniques for identifying interchange characteristics where graphic guide signs might be required and applicable. In the laboratory sign testing procedure, one 35 millimeter slide projector showed a roadway scene in which the guide signs were blacked out and another projector showed a scale model test sign in the blacked out area for one second. Characteristics of interchanges where graphic guide signs should be considered were identified by theoretical analyses. Laboratory tests indicated that route guidance was provided significantly better by graphic signs than by conventional signs on certain interchanges. Graphic signs also convey relative exit speeds and lane drop information effectively.
HS-013 072

EVALUATION OF DIAGRAMMATIC GUIDE SIGNS

Sponsored by Highway Res. Board Com. on Motorist Information Systems.
Highway Research Record n414 p30-41

*Traffic signs, *Highway signs, *Sign design, *Sign effectiveness, *Symbols, *Sign tests, *Sign recognition, *Pattern recognition, *Interchanges, *Laboratory tests, *Driver performance, *Slides (visual aids), *Test volunteers, *Driver errors, *Exits, *Europe, *Foreign signs, *Diagrammatic signs,

A laboratory evaluation was made of diagrammatic signs for a freeway clover leaf intersection, a lane drop, a multiple-split ramp, a left ramp downstream from a right ramp, two right ramps in quick succession, and a major fork. The evaluation included a comparison of diagrammatic and conventional signs, based on the speed and accuracy of the subjects' lane selections. Conventional signs were slightly more effective overall than experimental diagrammatic signs. They produced fewer lane-placement errors and errors on exit lanes, and were more quickly responded to than diagrammatic signs. The conventional signs were preferred by the subjects. In none of the six types of interchanges tested did diagrammatic signs provide better performance than conventional signs. Of the diagrammatic signs tested, the one showing a large exit arrow gave the best performance. The major fork symbol also showed up fairly well.

HS-013 073

DIAGRAMMATIC SIGN STUDY

A. W. Roberts
Sponsored by Highway Res. Board Com. on Motorist Information Systems.

Highway Research Record n414 p42-9

*Diagrammatic signs, *Sign effectiveness, *Sign tests, *Sign design, *New Jersey, *Interchanges, *Driver confusion, *Driver behavior, *Exits, *Statistical analysis,

Diagrammatic signs offer inherent improvements in road sign communication. Motorists are provided with more complete information on exits without additional words. The findings of this study show an improvement in exiting maneuvers after diagrammatic signs were installed and after lane lines were added to the diagrams on northbound I-287 at the left exit to westbound US-22. It is recommended that further evaluation of diagrammatic signing be carried out for a variety of exit configurations and for a whole series of interchanges. Serious consideration should be given to including the diagrammatic concept in new standards.

HS-013 074

DRIVER INFORMATION SYSTEMS FOR HIGHWAY RAILWAY GRADE CROSSINGS

Sponsored by Highway Res. Board Com. on Hwy. Railroad Grade Crossings.

Highway Research Record n414 p 59-77

*Railroad grade crossings, *Driver attitudes, *Attitude scaling, *Railroad grade crossing signs, *Hazards, *Changeable message signs, *Display systems, *Radio communication, *Data acquisition, *Highway improvements, *Warning systems, *Flashing lamps, *Surveys, *Least squares method, *Accident severity, *Accident prevention, *Driver sex, *Driver age, *Driver educational levels, *Driver mileage, *Income, *Railroad grade crossing accidents,

The first objective of this research was to evaluate driver attitudes concerning hazards at railroad grade crossings. Respondents considered railroad grade crossings relatively more hazardous than other potential highway hazards but considered none of the potential hazards to be very serious. The second objective was to evaluate the economic priorities for improving railroad grade crossing relative to eight other highway improvements. Respondents considered safety at railroad grade

crossings to be very important. The third objective was to evaluate driver preferences for information systems to be used at railroad grade crossings. An overhead changeable message sign was the most preferred alternative method of warning. The fourth objective was to evaluate driver preferences for messages to be used in an information system for railroad grade crossings. The respondents preferred information even when no train was present and preferred full words rather than abbreviations.

HS-013 075

LANE-CHANGE FREQUENCIES IN FREEWAY TRAFFIC FLOW

J. Pahl

Includes discussion by R. D. Worrall (Peat, Marwick, Mitchell and Co.).

Highway Research Record n409 p17-25

*Lane changing, *Freeway driving, *Ramps, *Exits, *Traffic flow, *Driver behavior, *Vehicle trajectories, *Vehicle trajectory recording systems, *Data acquisition, *Data analysis, *Photographs, *Mathematical analysis,

Lane change frequencies of exiting vehicles close to their intended off ramp and of through vehicles were determined empirically for an eight-, a six-, and a four-lane freeway site. The results were obtained for various flow levels and as a function of upstream distance from the off ramp. Data were acquired by aerial photographs that resulted in digitized space-time trajectories of all vehicles traversing the study sites. For each studied flow level at the various sites, lane change frequencies are presented for each lane pair and for exiting and through vehicles independent of lanes. Results show that the greatest frequency of exiting-vehicle lane changes is toward the right lane and that a corresponding increased frequency of through-vehicle lane changes is toward the left lane. At off ramps, through vehicles tend to move back toward the right lane and to have high lane-change frequencies.

HS-013 078

TRAFFIC ON UTAH HIGHWAYS, 1972

Utah State Dept. of Highways

In cooperation with Federal Hwy. Administration.
Corporate author \$5.00

*Traffic volume, *Traffic counts, *Utah, *Traffic data analysis, *Traffic surveys, *Interstate highway system, *Primary highways, *Secondary roads, *Month, *Day of week, *Maps, *Statistical analysis,

The data contained in this traffic report represent the average daily traffic volumes on road sections of varying lengths on the Interstate, Primary, Federal aid Secondary, and State (only) highways within the State of Utah. For comparative purposes, previous average daily traffic volumes are shown for the years 1937, 1940, 1945, 1950, 1955, 1960, 1965, 1970, and 1971. Data obtained from all permanently located automatic traffic recorder machines are also presented. This tabulation depicts average traffic by day of week for each month; average weekday traffic by months; average day of week traffic by months; percent the average day is of the average weekday; percent the monthly daily average is of the yearly daily average; and percentage breakdown by vehicle types for the yearly average.

HS-013 093

Field 3—HUMAN FACTORS**Group 3A—Alcohol****3. HUMAN FACTORS****3A. Alcohol****ALCOHOL AND AUTO ACCIDENTS IN EUROPE**

V31 N1

K. W. Herrick

Report on Alcohol v31 n1 p3-31

*Drinking drivers, *Driver intoxication, *Alcohol usage deterrents, *International factors, *Alcohol laws, *Law enforcement, *Blood alcohol levels, *Accident rates, *Alcohol breath tests, *Public opinion, *Penalties, *Insurance, *Alcohol education, *England, *Sweden, *Germany, *Italy, *Spain, *France, *Yugoslavia,

Reduction of European drunken driving accidents is not feasible until people understand alcohol effects and support strong penalties for driver intoxication. Police, judge, and jury attitudes are critical in successful drunken driving accident prevention programs. The definition of drunken driving must be stated quantitatively in the law. Police should be equipped with and regularly use alcohol breath testing devices. Police authority to test must be granted by law and suspects refusing to be tested should be presumed guilty. Occasional road-block alcohol testing should be utilized. Percentage of income fines and drunk driving exclusions in auto insurance policies are effective financial deterrents. Driver's license suspension has not been an effective penalty because many people continue to drive without a license. Automatic jail sentences for those who drive when their licenses have been suspended might help. Jail may be an effective deterrent for social drinkers but not for alcoholics.

HS-013 037

3B. Anthropomorphic Data**THE AUTOMOTIVE CRASH TEST DUMMY, ITS INSTRUMENTATION AND TESTING**

Department of Transp.

S. H. Backaitis

Presented at the 19th annual technical meeting of the Institute of Environmental Sciences, Anaheim, Calif., 2-5 Apr 1973, and published in the Proceedings.

Northwest Highway, Mt. Prospect Ill. 60056

*Anthropomorphic dummies, *Human body simulation, *Anthropomorphic dummy design, *Occupant modeling, *Biokinematic models, *Accelerometers, *Inertial forces, *Instrumentation, *Sensors, *Measurement,

To arrive at a better test dummy for compliance test programs, it is necessary to create a rigid set of definitions and specifications. However, since the test dummy is a high fidelity instrument carrier the associated instrumentation and data channel response must be specially tailored for this purpose. Test dummy impact response is also governed by dummy set-up and use procedures. To attain good replication of response, it is essential to control all of the event/environment parameters in a rigorous manner. To be sure that the test dummy is capable of performing repeatedly, it is also necessary to subject it to extensive checkout procedures. Future test dummy developments are following the trends of fewer mechanical complications and improved repeatability. These developments are being made

3D. Driver Behavior**IS A YOUNG DRIVER A GOOD DRIVER?**

V6 N9

Driver v6 n9 p1, 3-4

*Young adult drivers, *Age factor in driving, *Driver experience, *Driver physical fitness, *Driver reaction time, *Driver skills, *Judgment, *Alcohol effects, *Sex factor in driving, *Drug effects,

Driving skill, driver age and physical fitness, and driver reaction time are briefly discussed. It is concluded that a skilled, young, quick driver cannot be a good driver without the addition of good judgment gained from driving experience. Detrimental effects that alcohol and drugs can have on a driver's judgment are mentioned.

HS-013 039

ATTENTIONAL DEMAND AS A MEASURE OF THE INFLUENCE OF VISIBILITY CONDITIONS ON DRIVING TASK DIFFICULTY

E. Farber

Includes discussion by F. Lehman (Newark Coll. of Engineering). Sponsored by Highway Res. Board Com. on Motorist Information Systems.

Highway Research Record n414 pl-5

*Reduced visibility, *Driving task analysis, *Tracking, *Driver performance, *Light conditions, *Attention, *Face shields, *Goggles, *Optical filters, *Lateral acceleration, *Driver skills, *Helmets, *Performance tests, *Driver behavior, *Instrumented vehicles, *Test tracks, *Test volunteers,

Six drivers were required to negotiate a slalom course at an automatically controlled speed (30 or 45 mph) while wearing goggles fitted with various neutral-density filters and a motorcycle helmet with a gas piston-operated translucent face shield. The face shield could be moved from its normally occluding position for a half second look by means of a foot switch accessible to the driver. Attentional demand as measured by frequency of looks increased significantly with increasing goggle density at both 30 and 45 mph. The effect of the goggles on attentional demand was stronger at 45 than at 30 mph and for frequently looking than for infrequently looking subjects. Within subjects (error) variability was very low. Other measures of performances were not influenced by the goggles. It was concluded that attentional demand provides a measure of control task difficulty or operator skill to which conventional measurements may be insensitive.

HS-013 069

RECOGNITION OF TRAFFIC-CONTROL SIGNS

For primary bibliographic entry see Fld. 21.

HS-013 071

CRITERIA FOR DESIGN AND DEPLOYMENT OF ADVANCED GRAPHIC GUIDE SIGNS

For primary bibliographic entry see Fld. 21.

HS-013 072

EVALUATION OF DIAGRAMMATIC GUIDE SIGNS

Driver Education—Group 3E

DRIVER INFORMATION SYSTEMS FOR HIGHWAY RAILWAY GRADE CROSSINGS

For primary bibliographic entry see Fld. 21.
HS-013 075

LANE-CHANGE FREQUENCIES IN FREEWAY TRAFFIC FLOW

For primary bibliographic entry see Fld. 21.
HS-013 078

THE PREDICTION OF ACCIDENT LIABILITY THROUGH BIOGRAPHICAL DATA AND PSYCHOMETRIC TESTS. FINAL REPORT

California Dept. of Motor Vehicles
R. M. Harano R. S. McBride R. C. Peck CAL-DMV-RSS-73-39
Contract HPR-PR-1 (8)-B0132
Sponsored by the California Div. of Highways in cooperation with the Federal Hwy. Administration.
NTIS

*Accident responsibility, *Liability, *Accident risk forecasting, *Accident proneness. Driver performance, *Psychometrics, *Driving simulators, *Driver tests, *Driver records, *Convictions, *Psychological tests, *Vision tests, *Driver reaction time, *Driver attitudes, *Driver interviews, *Perception, *Driving task analysis, *Male drivers, *Female drivers, *Driver age, *Driver personality, *Driver mileage, *Socioeconomic data, *Parent child relations, *Marital status, *Drinking drivers, *High risk drivers, *Low risk drivers, *Driver skills, *Coordination, *Regression analysis, *Data analysis, *Accident factors, *Correlation analysis, *California,

Accident and accident-free drivers are contrasted to determine accident involvement factors. Biographical and driving-related data, personality, attitudes, parental relationships, perception, coordination, and driving simulator performance were studied. For males, the final construct sample multiple regression equation resulted in a multiple regression of .69, which shrank to .48 upon cross-validation. The concurrent prediction equation correctly classified 68.9% of accident-free and 71.2% of accident-involved drivers. Significant cross-validation variables were marital status, mileage, convictions, socioeconomic factors, rating driving ability in comparison to elderly drivers, and personality and attitudes derived from a psychometric inventory. None of the perceptual motor and simulator performance measures proved significant. Driver classification through cluster analysis revealed several high and low risk types. Results for females paralleled findings for males.

HS-013 082

TRUCK AND BUS DRIVER TASK ANALYSIS. FINAL REPORT

Michigan Univ. Hwy. Safety Res. Inst.
G. L. Moe G. R. Kelley D. E. Farlow
Contract FH-11-7616
Report for Sep-Nov 1972. Subcontracted to Human Factors Res., Inc., subcontract-1
NTIS

*Driving task analysis, *Truck drivers, *Bus drivers, *Ranking, *Checklists, *Acceleration, *Gear shifting, *Vehicle control, *Steering, *Passing, *Braking, *Backing, *Parking, *Vehicle inspection, *Driver emergency responses, *Tire failures, *Fires, *Brake failures, *Engine failures, *Passengers, *Trailers, *Towing, *U turns, *Attention, *Routing,

The tasks involved in driving large trucks and buses are reviewed and evaluated by expert truck and bus drivers and ranked according to the criticality of a given task in context with operational situations. The tasks analyzed include trip planning; vehicle inspection; a three-mile vehicle performance check; accelerating to roadway speed; gear shifting; directional control; passing; surveillance and situation awareness; braking; stopping; turnabouts; backing; parking; driving in off-street areas; emergencies such as brake system and engine failures, fires, and blowouts; hooking up and uncoupling trailers; and carrying passengers.
HS-800 835

ANALYSIS OF PERFORMANCE MEASUREMENT AND TRAINING REQUIREMENTS FOR DRIVING DECISION MAKING IN EMERGENCY SITUATIONS. FINAL REPORT

Rochester Univ.
G. V. Barrett R. A. Alexander J. B. Forbes TR-55
Contract DOT-HS-167-2-512
NTIS

*Driver performance, *Decision making, *Driving task analysis, *Driver emergency responses, *Perceptual analysis, *Accident risk forecasting, *Driver classification, *Driver tests, *Driver evaluation devices, *Driver reaction time, *Driver education, *Mathematical models, *Driving task models, *Benefit cost analysis, *Feasibility studies, *Driver improvement, *Attention, *Driver personality, *Driving simulators, *Motion pictures, *Reviews, *Accident costs, *Driver education costs, *Probability theory, *Accident rates, *Driver age,

The purpose of this study was to determine the feasibility of developing procedures to measure driver decision making performance and the feasibility of improving that decision making performance through training. The study consisted of five inter-related tasks. First, critical driving situations were identified and driver decision making requirements were analyzed within a human information processing framework. Next, a review of measurement devices and a review of training techniques revealed serious deficiencies in these areas with respect to decision making. Four specific dimensions were identified as related to effective decision making. A classification training model was developed and was analyzed by a probabilistic policy making cost benefit model. The results indicated that a research and development program for driver testing and training should be established and a comprehensive research and development plan was proposed for four separate groups of drivers.
HS-800 867

3E. Driver Education**DRIVER EDUCATION: NEW QUALIFICATIONS FOR INSTRUCTORS**

V2 N2

Signal 99 v2 n2 p7-9

*Driver education, *Instructors, *Instructor certification, *Instructor training, *North Carolina, *High school driving courses,

A certification program for driver education teachers in North Carolina is discussed. Under the new program effective Sep-

Field 3—HUMAN FACTORS

Group 3E—Driver Education

tember, 1974, all new teachers entering driver education in the schools will be required to have at least 30 semester hours or approximately one quarter of their academic preparation in driver training study. Existing instructors in the driver training program have until September, 1977, to acquire full certification. It is felt that certification of driver education teachers will improve the quality of high school driving courses.
HS-013 045

ANALYSIS OF PERFORMANCE MEASUREMENT AND TRAINING REQUIREMENTS FOR DRIVING DECISION MAKING IN EMERGENCY SITUATIONS. FINAL REPORT

Rochester Univ.

For primary bibliographic entry see Fld. 3D.
HS-800 867

ANALYSIS OF PERFORMANCE MEASUREMENT AND TRAINING REQUIREMENTS FOR DRIVING DECISION MAKING IN EMERGENCY SITUATIONS. FINAL REPORT

Rochester Univ.

For primary bibliographic entry see Fld. 3D.
HS-800 867

3F. Driver Licensing

AN EVALUATION OF CALIFORNIA'S ORAL LICENSING EXAMINATION

California Dept. of Motor Vehicles
D. M. Harrington RR-40
Corporate author

*Driver license examination, *Driver licensing, *Driver educational levels, *Driver records, *Benefit cost analysis, *Audiovisual aids, *Interviews, *Tape recordings, *Test equipment, *Languages, *California, *State Motor Vehicle Departments, *Traffic signs, *Traffic laws, *Illiterate drivers,

California's method of testing illiterate applicants includes a recording asking questions about signs and laws, the use of interpreters, and person-to-person tests involving gestures and sketches. Due to the characteristics of the applicants and of the tests, only 49% pass on their first attempt compared to a pass rate of 88% on the written examination. It costs approximately \$5.00 to test each oral applicant, compared to three cents for the regular written test. Since there are approximately 20,000 oral applicants per year, the present method of testing costs approximately \$100,000.00 per year more than it would cost to test literate applicants. No significant difference between the accident frequency of oral tessees and that of other drivers was found. Three approaches to improving the oral test are recommended for further study: an entirely pictorial test, upgrading the present recorded oral test and use of audio-visual testing machines.
HS-013 081

3H. Environmental Effects

TRANSPORTATION NOISE AND NOISE FROM EQUIPMENT POWERED BY INTERNAL COMBUSTION ENGINES

Wyle Labs.

For primary bibliographic entry see Fld. 2G.
HS-013 053

3L. Vision

THREE-BEAM HEADLIGHT EVALUATION. FINAL REPORT

Airborne Instruments Lab.

For primary bibliographic entry see Fld. 5J.
HS-800 844

4. OTHER SAFETY-RELATED AREAS

4A. Codes And Laws

TRUCK NOISE--MEASUREMENTS AND CORRELATION TO INDUSTRY AND LAW ENFORCEMENT STANDARDS

McDonnell Douglas Astronautics Co.

For primary bibliographic entry see Fld. 2G.
HS-013 029

MOTOR CARRIER SAFETY REGULATIONS

Bureau of Motor Carrier Safety

Revised to include amendments as of 1 Jul 1971.
GPO \$.65

*Motor carriers, *Regulations, *Safety laws, *Professional drivers, *Driver license laws, *Driving, *Transportation regulation, *Vehicle inspection, *Vehicle maintenance, *Vehicle design, *Transportation of hazardous materials, *Accident reporting laws, *Accident records, *Work time standards,

Safety regulations concerning qualifications of drivers, driving of motor vehicles, parts and accessories necessary for safe operation, recording and reporting of accidents, hours of driver service, inspection and maintenance, and transportation of hazardous materials; driving and parking rules are presented.
HS-013 068

URBAN NOISE LEGISLATION

Chicago Dept. of Environmental Control
For primary bibliographic entry see Fld. 2G.
HS-013 095

4C. Cost Effectiveness

CRASHWORTHINESS--IN PERSPECTIVE

General Motors Corp.

For primary bibliographic entry see Fld. 5D.
HS-013 048

TRANSPORT POLICY ASSESSMENT: COSTS AND BENEFITS OF ENVIRONMENTAL QUALITY

For primary bibliographic entry see Fld. 2G.
HS-013 052

ANALYSIS OF PERFORMANCE MEASUREMENT AND TRAINING REQUIREMENTS FOR DRIVING DECISION MAKING IN EMERGENCY SITUATIONS. FINAL REPORT

Rochester Univ.

For primary bibliographic entry see Fld. 3D.

HS-800 867

4D. Governmental Aspects

DEPARTMENT OF TRANSPORTATION SIXTH ANNUAL REPORT. FISCAL YEAR 1972

Department of Transp.
For primary bibliographic entry see Fld. 4H.
HS-013 041

4E. Information Technology

THE NEW CHRYSLER WIND TUNNEL

Chrysler Corp.
For primary bibliographic entry see Fld. 5D.
HS-013 062

FLASH, A COOPERATIVE MOTORIST AID SYSTEM. FINAL REPORT

Airborne Instruments Lab.
For primary bibliographic entry see Fld. 2B.
HS-013 079

4G. Mathematical Sciences

A STUDY OF AUTOMOTIVE ENERGY-ABSORBING BUMPERS

Ford Motor Co.
For primary bibliographic entry see Fld. 5D.
HS-013 056

A COMPUTER SIMULATION OF A SPARK IGNITION ENGINE

Loughborough Univ. of Technology (England)
For primary bibliographic entry see Fld. 5D.
HS-013 059

DESIGN OF ENGINE ACCESSORY MOUNTING SYSTEMS SUBJECT TO LARGE VIBRATIONS

Ford Motor Co.
For primary bibliographic entry see Fld. 5D.
HS-013 060

FACTORS AFFECTING SMOKE AND GASEOUS EMISSIONS FROM DIRECT INJECTION ENGINES AND A METHOD OF CALCULATION

C.A.V. Ltd. (England)
For primary bibliographic entry see Fld. 5F.
HS-013 064

EFFECTS OF TIRE SLIP ON THE HANDLING PERFORMANCE OF TRACTOR SEMITRAILERS IN BRAKING MANEUVERS

Michigan Univ. Hwy. Safety Res. Inst.
For primary bibliographic entry see Fld. 5R.
HS-013 066

WHY THE DIFFERENCE IN ACCIDENT PRICE TAGS?

For primary bibliographic entry see Fld. 1.
HS-013 077

LANE-CHANGE FREQUENCIES IN FREEWAY TRAFFIC FLOW

For primary bibliographic entry see Fld. 2I.
HS-013 078

METHODS FOR DETERMINING THE COLLISION PERFORMANCE OF SOME ENERGY ABSORBERS IN AUTOMOBILE BUMPER APPLICATIONS. FINAL REPORT

Denver Res. Inst.
For primary bibliographic entry see Fld. 5D.
HS-013 080

HOW TIRES WEAR

For primary bibliographic entry see Fld. 5V.
HS-013 088

4H. Transportation Systems

DEPARTMENT OF TRANSPORTATION SIXTH ANNUAL REPORT. FISCAL YEAR 1972

Department of Transp.

GPO \$1.85

*Annual reports, *Laws, *Safety research, *Safety programs, *Accident prevention, *Security systems, *Environmental research, *Transportation planning, *Highway transportation, *Highway safety, *Marine transportation, *Air transportation, *Rail transportation, *Motor carriers, *International factors, *Sociological factors, *Emergencies, *National defense, *Dept. of Transportation,

Areas of the Department of Transportation's work described are legislation; safety and security; environmental improvement; planning and formulation of national transportation policy; efforts to improve social conditions; research and development; program developments; international transportation developments; emergency and national defense transportation; and organizational and administrative developments. All forms of transportation are included: highway, motor carrier, aviation, railroad, and marine.
HS-013 041

WORLD TRANSPORTATION DEVELOPMENT: ECOLOGICAL ASPECTS

For primary bibliographic entry see Fld. 2G.
HS-013 051

5. VEHICLE SAFETY

5A. Brake Systems

THE MANOEUVRABILITY AND BRAKING PERFORMANCE OF SMALL-WHEELED BICYCLES WHEN RIDDEN BY CHILDREN

Transport and Road Res. Lab. (England)
For primary bibliographic entry see Fld. 5C.
HS-013 026

1972 AUTOMOBILE FACTS AND FIGURES

Motor Vehicle Manufacturers Assoc. of the United States, Inc.

Field 5—VEHICLE SAFETY

Group 5A—Brake Systems

For primary bibliographic entry see Fld. 5L.
HS-013 042

INERTIA DYNAMOMETER EVALUATION OF BRAKE LINING MATERIALS

National Hwy. Traf. Safety Administration
J. D. Preston SAE-730192
Presented at International Automotive Engineering Congress,
Detroit, 8-12 Jan 1973.
SAE

*Brake lining materials, *Inertia dynamometers, *Brake lining tests, *Brake performance, *Brake fade, *Brake standards, *Simulation, *Road tests, *Brake temperature, *Brake torque, *Coefficient of friction, *Brake friction, *Performance tests, *Disc brakes, *Drum brakes, *Brake thermal factors,

Brake lining performance as depicted by small friction machines does not reflect the performance obtained during vehicle brake tests. This paper shows that an inertia dynamometer using full-scale vehicle brake hardware can be programmed to simulate vehicle test conditions and produce brake performance data corresponding to vehicle test data. Methods for determining the dynamometer flywheel inertia and brake cooling airflow are discussed.
HS-013 049

EFFECTS OF TIRE SLIP ON THE HANDLING PERFORMANCE OF TRACTOR SEMITRAILERS IN BRAKING MANEUVERS

Michigan Univ. Hwy. Safety Res. Inst.
For primary bibliographic entry see Fld. 5R.
HS-013 066

TRAILER BRAKING PERFORMANCE-- RECREATIONAL VEHICLES. FINAL REPORT

Dynamic Science
E. Enserink 2300-73-24
Contract DOT-HS-046-2-429
Report for Jul-Dec 1972.
NTIS

*Trailer brakes, *Brake performance, *Brake tests, *Trailers, *Hydraulic brakes, *Electromagnetic brakes, *Test equipment, *Transducers, *Decelerometers, *Pedal force, *Recreational vehicles, *Stopping distance, *Deceleration, *Fifth wheel devices, *Vehicle characteristics, *Data acquisition, *Speed sensors, *Brake temperature, *Oscillographs, *Control equipment, *Loads (forces), *Drawbars, *Data reduction, *Brake fade, *Performance tests, *Burnishing, *Specifications, *Pressure,

A trailer braking test program was conducted to obtain baseline data on the performance of brakes on various recreational trailers and to develop a standardized test procedure for use by both industry and the Government. Tests were conducted with six tow vehicles and nine trailers. These were used in various combinations for a total of 27 tests. The tow vehicles ranged in size from a subcompact to a 3/4-ton pickup truck. Trailer types included utility, camping, vacation, travel, and boat trailers which were equipped with either hydraulic or electric brakes. Data collected during each test included vehicle speed, stopping distance, brake pedal force, brake line pressure, deceleration rate, brake temperatures, vertical and longitudinal drawbar loads, and trailer brake electrical current. Effectiveness as well

HSL 73, No. 17

as fade and recovery tests were run on the tow vehicle alone and on the tow vehicle-trailer combination.
HS-800 837

ACCIDENT AVOIDANCE EVALUATION OF GENERAL MOTORS EXPERIMENTAL SAFETY VEHICLE. FINAL REPORT

Dynamic Science
2310-73-1
Contract DOT-HS-046-2-468
Report for Jul-Dec 1972.
NTIS

*Experimental vehicles, *Safety cars, *Accident avoidance, *Automobile design, *Automobile performance, *Accident avoidance tests, *Vehicle weight, *Automobile dimensions, *Test facilities, *Automobile handling, *Brake performance, *Design standards, *Data acquisition, *Data reduction, *Engine performance, *Fifth wheel devices, *Instrumented vehicles, *Brake tests, *Brake system design, *Stopping distance, *Pedal force, *Brake pedals, *Parking brakes, *Yaw, *Steady state, *Lateral acceleration, *Vehicle control, *Passenger compartments, *Automobile stability, *Engine tests, *Field of view, *Tire slip motion, *Steering tests, *Automobile safety characteristics, *Returnability tests,

The weight, dimensions, passenger capacity, and overall body style definitions of two General Motors experimental safety vehicles (ESV) were evaluated and compared with federal ESV design requirements. The accident avoidance performance of the two ESV's was measured by tests of brake, steering, engine, and handling performance; overturn immunity; and visibility. Test results are summarized in tabular form.
HS-800 854

5B. Buses, School Buses, And Multipurpose Passenger Vehicles

HIGHWAY ACCIDENT REPORT--RUNOFF AND OVERTURN OF INTERCITY BUS ON INTERSTATE 95, RICHMOND, VIRGINIA, SEPTEMBER 3, 1972

National Transp. Safety Board
For primary bibliographic entry see Fld. 1C.
HS-013 035

MOTOR CARRIER SAFETY REGULATIONS

Bureau of Motor Carrier Safety
For primary bibliographic entry see Fld. 4A.
HS-013 068

STRUCTURE VERIFICATION OF BUS PASSENGER SEATS. FINAL REPORT

Virginia Polytechnic Inst. and State Univ.
E. L. Sittler
Contract DOT-HS-069-2-334
Report for Mar-Aug 1972.
NTIS

*Seat design, *Buses, *Seat tests, *Structural design, *Structural deformation analysis, *Seat frames, *Seat loading, *Energy absorbing seats, *Seat cushions, *Cushion retainers, *Seat backs, *Stiffness, *Linkages, *Seat standards, *Compliance tests,

The requirements of the proposed rulemaking for bus passenger seat structural design are evaluated from a compliance test standpoint. The program was concerned with a structural design of a bus passenger seat to minimize passenger injury on impact. This was accomplished by testing seat and linkage design, rearward and upward loading and seat cushion retention. Verification tests of forward and rearward restraint performance, seat assembly upward performance, and seat cushion retention were conducted. It was determined that a bus seat can be designed and fabricated that will meet established design criteria. The forward restraint performance criteria is the most critical design problem to be solved. Loads entering the floor caused by the forward loading are extremely high. Seat weight can be reduced greatly by using production tooling processes to obtain adequate stiffness through section modulus and geometry rather than brute strength as used in this design.

HS-800 871

SAFETY OF WIDE BUSES. SUMMARY REPORT

National Hwy. Traf. Safety Administration
E. Kakaley D. F. Mela 2nd, G. B. Pilkington 3rd, F. J. Daniels T. L. Friesz
NTIS

*Vehicle width, *Bus stability, *Bus tests, *Passing, *Aerodynamics, *Offtracking, *Lane width, *Crosswind, *Wind tunnel tests, *Road tests, *Scale models, *Lateral vehicle spacing, *Steering, *Braking, *Accident statistics, *Bus accidents, *Vehicle width effects on traffic,

The performance of 96- and 102-inch wide buses and their effects on cars were determined from results of wind tunnel tests and road tests on the Interstate Highway System. Conclusions are based on lane widths of at least 12 feet. The effect of crosswind caused greater aerodynamic disturbances than bus width. The automobile driver does not distinguish between 96- and 102-inch wide buses when changing his path to avoid the bus. The stability of the 102-inch wide bus is equal to or better than the 96-inch wide bus with regard to the tendency to spin out and susceptibility to roll over in typical highway maneuvers including braking. Offtracking is not a problem for buses using through traffic lanes. There are no significant differences between accident rates of 96- and 102-inch wide buses. Accident rates show that the bus is the safest form of highway travel, changing his path to avoid the bus. The stability of the 102-inch wide bus is equal to or better than the 96-inch wide bus with regard to the tendency to spin out and susceptibility to roll over in typical highway maneuvers including braking. Offtracking is not a problem for buses

HS-820 265

5C. Cycles

THE MANOEVRABILITY AND BRAKING PERFORMANCE OF SMALL-WHEELED BICYCLES WHEN RIDDEN BY CHILDREN

Transport and Road Res. Lab. (England)
G. D. Lewis TRRL-LR-500
Corporate author

*Bicycle handling, *Bicycle safety, *Brake tests, *Brake performance, *Bicycle brakes, *Bicycle characteristics, *Children, *Variance analysis, *Bicycle accidents, *Questionnaires, *Wet road conditions, *Dry road conditions,

Tests were conducted to find out how the braking performance and maneuverability of small-wheeled bicycles compared with those of more conventional machines when ridden by children. Six bicycles having wheels of different diameter were used and 100 children between 8 and 11 years old rode them. The results of the maneuverability tests showed that, although there was little difference in the ability of a given child to maneuver the different machines, there were considerable differences in this respect among the children. In the dry braking tests some differences were observed in the braking performance but because there were considerable variations in the individual measurements, these differences were not found to be of practical significance. When the wheels and brakes on the machines were wetted, two of the machines had a much better braking performance; one of them had a hub brake and the other had the smallest diameter wheels.

HS-013 026

5D. Design

THE EXPERIMENTAL SAFETY VEHICLE PROGRAM

National Hwy. Traf. Safety Administration
J. A. Edwards
In HS-013 085

*Experimental automobiles, *Safety cars, *Crashworthiness, *Automobile design, *International factors,

An overview of the objectives and goals of NHTSA's Experimental Safety Vehicle (ESV) Program is presented, as well as a description of the initial ESV project, the family sedan. The international ESV program is summarized and future plans for the ESV program are briefly outlined.

HS-013 047

CRASHWORTHINESS--IN PERSPECTIVE

General Motors Corp.
R. A. Wilson
In HS-013 085

*Crashworthiness, *Accident survivability, *Safety research, *Injury prevention, *Impact tests, *Impact sleds, *Driver vehicle road interfaces, *Automobile design, *Occupant protection, *Occupant kinematics, *Human body impact tolerances, *Highway improvements, *Data acquisition, *Benefit cost analysis, *Accident studies, *Precrash phase, *Crash phase, *Post-crash phase,

A brief history of crashworthiness research is presented. While the major emphasis in the past has been on the characteristics of the vehicle, it is also appropriate to consider the crashworthiness of the highway and the crashworthiness of the human body. The four major variables which can be manipulated by crashworthiness researchers are impact area, stopping distance, velocity change, and mass. In each of these it is necessary to reduce the number of uncontrollable factors and to reduce the injury potential of the controllable factors. The three main kinds of crash testing used to determine crashworthiness, full-scale testing, impact sled testing, and component testing, are described. Some of the constraints placed on the development of a crashworthy vehicle are outlined and the need for benefit cost analysis is emphasized.

HS-013 048

FORM AS A VISUAL COMMUNICATOR

Stanford Univ.

L. W. Knight SAE-730020

Presented at the International Automotive Engineering Congress, Detroit, 8-12 Jan 1973.
SAE

*Form perception, *Shape, *Aesthetics, *Vehicle design, *Environmental impact statements, *Coding systems, *Human factors engineering,

The importance of visual form in the human environment is discussed. Form is defined as gross three-dimensional shape and is treated as a dimension that should be considered of equal importance with other functions in the design process. The area of design thinking that exists between the traditional form considerations of human factors engineering and the purely aesthetic-artistic is examined. In order to confirm form as language, it is necessary to understand how form communicates, and what is being communicated. This concept is presented in two parts: the first explores man-made objects and environments as examples of how and what form communicates; the second part probes vehicular design as a logical area for application of a form-value system.

HS-013 055

A STUDY OF AUTOMOTIVE ENERGY-ABSORBING BUMPERS

Ford Motor Co.

H. Wu SAE-730024

Presented at International Automotive Engineering Congress, Detroit, 8-12 Jan 1973.
SAE

*Energy absorbing bumpers, *Bumper design, *Bumper tests, *Barrier collision tests, *Pendulum tests, *Head on collisions, *Energy absorption, *Impact velocity, *Displacement, *Deflection, *Force, *Loads (forces),

Energy-absorbing units for automotive bumper applications are analyzed and general criteria concerning their design and performance are presented to provide an analytical outline of the parameters involved. An example case of head on impact between two vehicles with mass ratio of 1:2 reveals the effect of heavy vehicle absorber design upon lighter vehicle damageability. A good fixed type of automotive impact-absorbing bumper system should require the smallest stroke possible for a given unit-design energy and unit-design force limit, and should generate the lowest resisting force possible during impact at speeds up to the unit barrier design speed for a given stroke limit. This implies a constant stroke, up to design speed.

HS-013 056

URETHANE FLEXIBLE BODY PARTS

General Motors Corp.

Jr., P. A. Haines SAE-730026

Presented at International Automotive Engineering Congress, Detroit, 8-12 Jan 1973.
SAE

*Urethanes, *Urethane bumpers, *Automobile materials, *Pendulum tests, *Bumper tests, *Materials tests, *Casting, *Molding, *Automotive parts,

The current applications of urethane in flexible body parts which for 1973 cars has resulted in designs for bumper covers, bumper to body fillers, and body extensions are discussed. The flexible parts are color-keyed extensions of the body surface also matching the car body in impact capability. The advantages and disadvantages of the cast-urethane process and injection-molded process are presented.

HS-013 057

A HIGH ENERGY LEVEL PNEUMATIC ENERGY ABSORBING BUMPER

Firestone Tire and Rubber Co.

J. E. Gieck D. A. Weitzenhof E. J. Merz SAE-730029

Presented at the International Automotive Engineering Congress, Detroit, 8-12 Jan 1973.
SAE

*Pneumatic bumpers, *Bumper design, *Bumper tests, *Elastomers, *Energy absorption, *Pendulum tests, *Barrier collision tests, *Deflection, *Impact velocity, *Aesthetics, *Vehicle vehicle collisions, *Bus tests, *Pressure, *Loads (forces), *Test equipment, *Dynamic tests, *Static tests,

A high energy level pneumatic (HELP) bumper has been developed for buses and commercial vehicles which has demonstrated 5 mph collision capability. Having a flexible front section molded from a castable elastomer, the pressurized system is equipped with relief valves that open at a predetermined pressure during collision, thus dissipating energy. The concept shows potential for application at significantly higher velocities.

HS-013 058

A COMPUTER SIMULATION OF A SPARK IGNITION ENGINE

Loughborough Univ. of Technology (England)

G. G. Lucas E. H. James SAE-730053

Presented at International Automotive Engineering Congress, Detroit, 8-12 Jan 1973.
SAE

*Computerized simulation, *Spark ignition engines, *Mathematical models, *Combustion, *Engine speeds, *Gas motion, *Flame propagation, *Turbulence, *Combustion rate, *Heat transfer, *Crank angle, *Cylinder pressure, *Compression ratio, *Temperature, *Parameters, *Water injection, *Ignition timing, *Carbon monoxide, *Nitric oxide, *Benzene, *Propane, *Isocetane,

The mathematical model of the compression, combustion, and expansion phases of the Renault IFP variable compression ratio research engine reported here is an attempt to combine as many as possible of the basic characteristics of engine combustion. Finite rates of flame propagation and heat release are computed on the basis of Semenov's theory. To allow for the effects of turbulence, Semenov's estimate of laminar burning velocity is multiplied by a term derived from flame speed measurements in the engine. Dissociation of the burned gases is compensated by chemical equilibrium and heat transfer data due to Annand. The computer model makes possible a parametric study of the effects of variables such as mixture composition, spark timing, compression ratio, engine speed, exhaust residuals, and injected water as a means of controlling certain emissions resulting from use of propane, isocetane, and benzene fuels. Experimental data corroborate the accuracy of the model.

HS-013 059

DESIGN OF ENGINE ACCESSORY MOUNTING SYSTEMS SUBJECT TO LARGE VIBRATIONS

Ford Motor Co.

SAE-730056

Presented at International Automotive Engineering Congress, Detroit, 8-12 Jan 1973.

SAE

*Engine design, *Durability tests, *Vibration response, *Engine speeds, *Alternators, *Accelerometers, *Mathematical models, *Equations of motion, *Performance tests, *Frequencies,

A systematic method for obtaining an acceptable mounting system for engine accessories in a short length of time with minimum redesign of metal components is presented. A mathematical model is used to determine the various resonance conditions. Electronic instrumentation is used to verify the behavior of the system and determine amplitudes of vibration. Endurance tests were conducted to confirm analytical and experimental results. The analytical model showed good correlation with experimentally measured data. The analytical approach can be used in the earlier design stage to define the system response to forced vibrations so that any natural frequency present may be moved outside the engine speed range. This design approach as presented was developed to deal with the alternator mounting system subject to the secondary unbalanced force of in-line four-cylinder engines; however, it may be used for any accessory bracket system subject to forced vibration.

HS-013 060

ENERGY ABSORPTION BY STRUCTURAL DEFORMATION

Citroen S. A. (France)

R. Larousse SAE-730077

Presented at International Automotive Engineering Congress, Detroit, 8-12 Jan 1973.

SAE

*Energy absorption, *Structural deformation analysis, *Energy absorbing materials, *Barrier collision tests, *Energy absorbing frames, *Crush distance, *Laboratory tests, *Impact velocity, *Loading (mechanical), *Compact automobiles, *Deceleration,

Two forms of energy absorption are discussed. The first, mechanical reinforcement, is a prototype part, a guided sliding tube in a box-like structure, which acts as an additional buffer attached to the front frame extension of a small automobile. The second form, foam injection, is applied through hollow elements of sheet steel less than one millimeter thick injected with rigid polyurethane foam. Laboratory tests have shown that it is unreasonable to consider impact speeds of more than 55 km/h for a loaded small vehicle, even after modification and reinforcement. Higher impact speeds would increase both weight and vehicle price, and increase occupant injury risk due to high deceleration within the vehicle.

HS-013 061

THE NEW CHRYSLER WIND TUNNEL

Chrysler Corp.

SAE-730239

Presented at International Automotive Engineering Congress, Detroit, 8-12 Jan 1973.

SAE

*Wind tunnels, *Wind tunnel tests, *Test equipment, *Computerized test methods, *Data acquisition, *Data reduction, *Instrumentation, *Measurement, *Data processing, *Air flow, *Road tests, *Reliability,

The Chrysler wind tunnel is a closed-circuit, single-return, semiopen jet facility used for performing engine cooling, transmission cooling, engine compartment airflow, underhood component temperature, air-conditioning, and other types of tests. It operates over a 0-120 mph speed range with 400 hp rear-wheel power absorption capacity. Special provisions have been made for idle, city traffic, and tail wind tests. Facility controls provide precise set-point capability, and comprehensive instrumentation and data acquisition systems permit measurement of many parameters and real time data reduction.

HS-013 062

EFFECT OF ADDITIVES ON THE MACHINABILITY AND PROPERTIES OF ALLOY-STEEL BARS

United States Steel Corp.

H. J. Tata R. E. Sampson SAE-730114

Presented at International Automotive Engineering Congress, Detroit, 8-12 Jan 1973.

SAE

*Steels, *Additives, *Machining, *Sulfur, *Selenium, *Lead, *Bismuth, *Performance tests, *Materials tests, *Temperature endurance tests, *Tools, *Tellurium, *Tensile strength, *Fatigue (materials), *Energy absorption, *Case hardening, *Hardness, *Consumer attitudes, *Surface roughness, *Wear tests, *Structural analysis, *Tension tests, *Fatigue tests, *Impact tests,

Research was conducted to select the free-machining additive that would greatly increase the machinability of American Iron and Steel Institute 8620- and 4140-type steels without adversely affecting their hot workability, chemical homogeneity, and mechanical and metallurgical properties. The additives investigated were sulfur, selenium, tellurium, lead, and bismuth. Selenium and tellurium were more effective in increasing machinability than were the other additives. Tellurium, even in small amounts, greatly increased scrap loss and conditioning loss. The potent effect of selenium on machinability was obtained with pearlite, bainite, and tempered martensite microstructures. The hardenability, impact properties, fatigue properties, and case-hardening characteristics of steels containing sulfur, selenium, tellurium, and lead were about the same. It was concluded that selenium is the optimum additive, and that the machinability of 8620- and 4140-type steels containing nominally 0.10% selenium is superior to that of commercially available 8620 and 4140 free-machining steels.

HS-013 063

CONTRIBUTION OF COMPRESSION MOLDED PLASTICS AND COMPOSITES TO THE AUTOMOTIVE INDUSTRIES

Guest, Keen, and Nettlefolds Ltd. (England)

D. Oddy SAE-730175

Presented at International Automotive Engineering Congress, Detroit, 8-12 Jan 1973.

SAE

*Plastics, *Composite materials, *Molding, *Mechanical properties, *Economic factors, *Automobile materials, *Fibers,

Group 5D—Design

*Tools, *Great Britain, *Hydraulic equipment, *Presses, *Strength (mechanics),

This paper reviews the opportunity for the use of compression molded plastics and composites in the automotive industry, in the light of the available materials. The mechanical properties, the processability, and the economics of fiber reinforced plastics (FRP) are discussed, and the tooling and machinery appropriate for compression molding of FRP are described.
HS-013 065

METHODS FOR DETERMINING THE COLLISION PERFORMANCE OF SOME ENERGY ABSORBERS IN AUTOMOBILE BUMPER APPLICATIONS. FINAL REPORT

Denver Res. Inst.
R. J. Green DRI-2581
Insurance Inst. for Hwy. Safety

*Energy absorbing bumpers, *Bumper design, *Bumper standards, *Safety device effectiveness, *Bumper tests, *Performance tests, *Bumper mounts, *Extruding, *Plastics, *Honeycomb structures, *Impact velocity, *Strain rate, *Viscosity, *Displacement, *Parameters, *Force, *Stress (mechanics), *Tubes, *Friction materials, *Coefficient of friction, *Energy absorption, *Deflection, *Barrier collision tests, *Torus devices, *Deformable sheet metal, *Shearing, *Metal cutting, *Drop tests, *Test equipment, *Test facilities, *Oscillographs,

Of the energy absorbing devices evaluated and tested, the extrusion type of device, such as a Menasco or Taylor Liquid Spring, appears to be best since it dissipates energy and has the reliability and the ability to withstand repeated impacts. The collapsing tube and the tube and mandrel devices are the best in the material deformation category. Their initial costs are substantially lower than the extrusion devices, but they cannot take repeated loads, being essentially one shot devices. In view of the recent regulations requiring energy absorbing bumpers to take multiple impacts, one shot devices are essentially ruled out. The rolling torus type of device has a poor length to stroke ratio and the manufacturing costs are high. Energy absorbing devices that rely mainly on friction are not well suited for use in automobile bumpers for collisions. Drop test procedures are outlined.
HS-013 080

CRASHWORTHINESS: SAFETY THROUGH AUTOMOTIVE DESIGN. NORTH CAROLINA SYMPOSIUM ON HIGHWAY SAFETY, CHAPEL HILL, N. C., SPRING 1972, VOL. 6

North Carolina Univ. Hwy. Safety Res. Center
ED., P. F. Waller
Includes HS-013 047--HS-013 048.
Corporate author

*Crashworthiness, *Automobile design, *Injury prevention, *Occupant protection, *Automobile safety characteristics, *Experimental automobiles, *Safety cars, *Impact tests, *Safety design, *Restraint systems,

The problem of highway safety has three interacting parts, the highway, the vehicle, and the driver. While none can be con-

sidered in isolation from the others, the consensus of experts in the field is that the greatest short-term payoff can be realized by concentrating on the vehicle. In any one year the new crop of vehicles constitutes approximately 10% of the total vehicle population. Consequently, the safety impact of vehicle improvements stands to be felt almost immediately. The status of research and development of crashworthy vehicles, vehicles that will absorb the impact of a crash in such a way that the occupants are likely to survive without serious injury, is discussed and the federal government's Experimental Safety Vehicle Program is described.
HS-013 085

ACCIDENT AVOIDANCE EVALUATION OF GENERAL MOTORS EXPERIMENTAL SAFETY VEHICLE. FINAL REPORT

Dynamic Science
For primary bibliographic entry see Flid. 5A.
HS-800 854

SAFETY OF WIDE BUSES. SUMMARY REPORT

National Hwy. Traf. Safety Administration
For primary bibliographic entry see Flid. 5B.
HS-820 265

5F. Fuel Systems

CATALYTIC CONVERTERS: WILL THE SEED MONEY PAY OFF?

V148 N8
J. M. Callahan Article-605
Automotive Industries v148 n8 p33-8

*Catalytic converters, *Exhaust emission control, *Exhaust emission standards, *Catalysts, *Exhaust emission control costs, *Compliance, *Durability, *Exhaust emission control device maintenance, *Air pollution control device inspection, *Fuel economy, *Exhaust system design,

The design, operation, manufacture, durability, maintenance, and cost of catalytic converters being developed by U. S. automobile manufacturers are outlined. None of the converters thus far developed meet 1975 emission standards. Catalysts can be destroyed by leaded fuel, excessive heat, or too much vibration. Because the catalyst can be destroyed without the driver's knowledge, periodic mandatory inspection may be necessary. The 1975 emission systems will also cost American car buyers approximately \$3 billion a year, but their impact on the nation's air will be hard to find in most areas. General Motors predicts that its 1975 cars will get the same fuel mileage as its 1973 models, while Ford and Chrysler anticipate a 5% drop in fuel economy.
HS-013 034

EVALUATING TRANSPORTATION CONTROLS TO REDUCE MOTOR VEHICLE EMISSIONS IN MAJOR METROPOLITAN AREAS

Institute of Public Administration
APTD-1364
Contract EPA-68-02-0048
Prepared in cooperation with TRW, Inc.
NTIS

*Exhaust emission control, *Vehicle inspection, *Vehicle maintenance, *Fuel systems, *Traffic flow, *Traffic control, *Public transportation, *Staggered work times, *Retrofitting, *Urban areas, *Transportation planning, *Exhaust emission standards, *Exhaust emission control costs, *Public transportation costs, *Exhaust emissions, *Highway usage restrictions, *Parking regulations, *Rapid transit systems, *Highway design, *Speed studies, *Intergovernmental relations, *State action, *Local government, *Federal aid, *Feasibility studies, *Benefit cost analysis, *Forecasting,

The feasibility of reducing vehicle exhaust emissions by implementing such methods as vehicle inspection, maintenance, and retrofit; conversion to gaseous fuel systems; traffic flow regulatory techniques; bypassing through traffic; improving public transportation; restricting road and vehicle use; and work schedule changes is examined from a cost benefit standpoint.
HS-013 044

THE ECONOMIC EFFECTIVENESS OF MANDATORY ENGINE MAINTENANCE FOR REDUCING VEHICLE EXHAUST EMISSIONS. CRC EXTENDED PHASE I STUDY. INTERIM REPORT

TRW Systems Group
APTD-1072; PB-209 25
Contract CPA-22-69-087
NTIS

*Exhaust emission control, *Vehicle inspection, *Engine maintenance, *Exhaust emission measurement, *Benefit cost analysis, *Inspection frequency, *Inspection procedures, *Maintenance costs, *Inspection costs, *Exhaust emission control costs, *Inspection stations, *Hydrocarbons, *Carbon monoxide, *Nitrogen oxides, *Inspection effectiveness, *Misfiring, *Air fuel ratio, *Figure of merit, *Ambient air quality, *Exhaust emission sampling, *Service stations, *Inspection equipment, *Demography, *Forecasting, *Mathematical analysis, *Loading (mechanical), *Linear programming, *Flow charts, *Statistical analysis, *Algorithms,

Yearly emission inspections are most cost effective. State lane inspections are more cost effective than franchised garage inspections, but produce smaller emission reductions. Inspection/maintenance cost-effectiveness depends on a region's demographic characteristics and air quality needs. The figure of merit is sensitive to weightings assigned hydrocarbon, carbon monoxide, and nitrogen oxide emission reductions and to the extent of imposed maintenance. The figure of merit and emission reductions are sensitive to maintenance deterioration rates, effectiveness of voluntary maintenance of ignition misfire and idle air/fuel ratio adjustment, and repair reliability. Using similar inspection/maintenance procedures, larger percentage reductions for hydrocarbons and nitric oxide and smaller reductions for carbon monoxide are estimated based upon mass as compared to volumetric emissions. Emission reductions are most sensitive to vehicle rejection inspection procedures and to the extent of imposed maintenance.
HS-013 054

FACTORS AFFECTING SMOKE AND GASEOUS EMISSIONS FROM DIRECT INJECTION ENGINES AND A METHOD OF CALCULATION

C.A.V. Ltd. (England)
I. M. KhanG. GreevesC. H. T. Wang SAE-730169

Presented at International Automotive Engineering Congress, Detroit, 8-12 Jan 1973.
SAE

*Diesel engine exhaust emissions, *Fuel injection, *Injection timing, *Air fuel ratio, *Exhaust gases, *Smoke, *Nitric oxide, *Engine speeds, *Combustion chamber swirl, *Carbon monoxide, *Hydrocarbons, *Engine tests, *Exhaust emission measurement, *Nozzles, *Unburned fuels, *Fuel mixtures, *Heat transfer, *Fuel sprays, *Exhaust emission control, *Mathematical models,

The effects of injection timing, injection rate, and air swirl on direct-injection diesel engine emissions are examined. Studies show that fuel-injection equipment and variables such as nozzle configuration affect pollutant production and emission because they affect fuel-air mixing. An increased injection or air swirl rate increases the fuel-air mixing rate and reduces the amount of exhaust smoke and its dependence on injection timing. An increase in rate or swirl ratio increases nitric oxide emission at a given injection timing, but the increase is relatively small compared with reduction obtained by retarding injection timing. Substantial retard, in conjunction with increased rate of fuel-air mixing, limits engine efficiency loss. A model has been developed for calculating soot and nitric oxide formation which predicts effects of injection timing, injection rate, fueling, air swirl ratio, and engine speed on exhaust concentrations of these pollutants.
HS-013 064

EQUILIBRIUM CONSIDERATIONS IN CATALYTIC EMISSION CONTROL

General Motors Corp.
G. J. BarnesR. L. KlimischB. B. Krieger SAE-730200
SAE

*Catalysis, *Exhaust emission control, *Catalysts, *Exhaust gases, *Air fuel ratio, *Gas dynamics, *Lean fuel mixtures, *Rich fuel mixtures, *Stoichiometry, *Exhaust densities, *Ammonia, *Pressure,

By providing a low-energy reaction path, catalysis may be the most effective method of reducing automotive air pollution. Since chemical equilibrium represents the ultimate limit of catalytic treatment of exhaust, equilibrium compositions were determined for nine air fuel mixtures, with overall air fuel ratios (A/Fs) of 12.1-17.1 (lb air/lb fuel), for temperatures 300-1500F. Hydrocarbons and nitrogen oxides are essentially eliminated when exhaust gases are equilibrated. Only carbon monoxide, of the major automotive air pollutants, is present in significant concentrations at equilibrium, and then only at rich A/F. True equilibria carbon monoxide concentrations are less than 0.25% for A/F greater than 14.6. It is suggested that formation of ammonia by nitric oxide reduction catalysis is caused by kinetic limitations which prevent catalytic formation of hydrocarbons. The formation of ammonia provides an alternate free-energy minimum for the exhaust gas system because of these kinetic limitations.
HS-013 067

TRANSPORTATION CONTROLS TO REDUCE MOTOR VEHICLE EMISSIONS IN PITTSBURGH, PENNSYLVANIA. FINAL REPORT

GCA Corp.
APTD-1446

Field 5—VEHICLE SAFETY**Group 5F—Fuel Systems**

Contract EPA-68-02-0041
Report for 14 Aug-15 Dec 1972.
Environmental Protection Agency; NTIS

*Exhaust emission control, *Transportation planning, *Air quality standards, *Forecasting, *Air pollution measurement, *Exhaust densities, *Pittsburgh, *Vehicle inspection, *Vehicle maintenance, *Highway improvements, *Traffic flow, *Parking regulations, *Rapid transit systems, *Retrofitting, *Carbon monoxide, *Hydrocarbons, *Oxidizers, *Topographical factors, *Meteorological data, *Climatology, *Sensors, *Time of day, *Month, *Vehicle age, *Central business districts, *Automobile bans, *Vehicle mileage, *Travel patterns, *Political factors, *Algorithms, *Economic analysis, *State action, *Local government, *Federal role,

Methods of controlling carbon monoxide and oxidant emissions to meet 1977 air quality standards in Pittsburgh are presented. The contribution of vehicle miles of travel to air pollution is emphasized. The effectiveness of suggested transportation controls, including traffic flow improvements, emission source control, increased transit use, increased vehicle occupancy, reduction of travel demands, and shifting of travel patterns, is evaluated. Implementation and surveillance methods are outlined, and the obstacles facing implementation of vehicle inspection and maintenance, parking rates and fringe parking, short term transit improvements, and upgrading existing streets are presented. The air quality impact of transportation controls is estimated.

HS-013 087

REDUCING AUTO EMISSIONS: SOME RELEVANT**FACTS**

V81 N5

R. L. Sansom

Automotive Engineering v81 n5 p37-9

*Exhaust emission control, *Vehicle air pollution, *Exhaust emission standards, *Air pollution effect on health, *Air pollution sources, *Environmental Protection Agency, *Exhaust emission control costs, *Fuel economy, *Automobile modification, *Retrofitting, *Exhaust system inspection, *Transportation regulation, *Clean Air Act of 1970,

In recent months industry leaders have raised serious questions about whether the Environmental Protection Agency's (EPA) actions in carrying out the mandates of the Clean Air Act amendments of 1970 are correct. In response to the criticisms directed at the EPA's strict control program, evidence is presented which indicates the seriousness of vehicle air pollution and the need for pollution controls. Three major transportation control alternatives—vehicle modifications, emission inspections, and transportation system controls—which will aid in alleviating the air pollution problem are briefly discussed. The EPA decision not to extend the implementation deadline of the 1975 vehicle emission standards is also reviewed.

HS-013 089

TRANSDUCERS FOR FUTURE POWERPLANT CONTROL SYSTEMS

V81 N5

Based on Automotive Powerplant Transducers--Fact or Fiction?, SAE-730573, by H. R. Mitchell and R. N. McGill.
Automotive Engineering v81 n5 p40-3

*Transducers, *Automobile engines, *Electronic devices, *Air flow, *Fuel flow, *Sensors, *Air fuel ratio, *Exhaust emission control, *Spark timing, *Metering,

Fuel and air metering, spark timing, and exhaust gas recirculation probably will require transducers of various types. Sophisticated transducers developed for the aerospace industry do not necessarily adapt well to the demands of automotive powerplants because automotive performance criteria often exceed those for aerospace. Yet because they are critical to the development of control systems for emissions reduction, a cooperative effort between the electronics and automotive industries must be mounted to improve transducer accuracy, stability, durability, and economy.

HS-013 090

ATMOSPHERIC POLLUTION FROM VEHICLE EMISSIONS; MEASUREMENTS IN READING 1971

Transport and Road Res. Lab. (England)

For primary bibliographic entry see Fld. 2G.

HS-013 092

5G. Glazing Materials**TINTED WINDSHIELDS DON'T INCREASE ACCIDENT RISK**

For primary bibliographic entry see Fld. 1C.

HS-013 091

5I. Inspections**THE ECONOMIC EFFECTIVENESS OF MANDATORY ENGINE MAINTENANCE FOR REDUCING VEHICLE EXHAUST EMISSIONS. CRC EXTENDED PHASE I STUDY. INTERIM REPORT**

TRW Systems Group

For primary bibliographic entry see Fld. 5F.

HS-013 054

5J. Lighting Systems**THREE-BEAM HEADLIGHT EVALUATION. FINAL REPORT**

Airborne Instruments Lab.

B. Adler-H. Luenfeld HS-238-2-411-1; AIL-

Contract DOT-HS-238-2-411

Report for 8 May 1972-18 Feb 1973.

NTIS

*Three beamed headlamps, *High beamed headlamps, *Low beamed headlamps, *Headlamp aiming, *Headlight brightness, *Headlamp glare, *Headlamp tests, *Compliance tests, *Sight distances, *Glare tolerances, *Rearview mirrors, *Instrumented vehicles, *Computer programs, *Automobile dimensions, *Headlamp regulations, *Headlamp standards, *Photometry, *Data reduction, *Automatic data processing, *Night driving, *Field of view, *Night visibility, *Light transmission, *Test volunteers, *Road tests, *Road grades, *Road curves, *Urban highways, *Rural roads, *Alignment, *Calibration, *Design of experiments, *Questionnaires,

Three different three-beam headlight configurations were evaluated. The high-beam mode, the only difference in the three

systems, combines high-beam and mid-beam filaments. The three configurations are 2-3-2, 2-3-3, and 2-3-4. Present aiming requirements are satisfactory for the three-beam systems. A computer program determines glare brightness in rearview mirrors as vehicles with the three configurations approach. The 2-3-3 and 2-3-4 configurations produce more glare than the 2-3-2 configuration, but not enough to negate their use. Vehicles equipped with the three systems were driven by six drivers over a three-night period. The drivers did not choose one system over another. Dimming requests by opposing traffic showed little deviation: the fewest requests were headed by the 2-3-4 system, followed by the 2-3-3, and then the 2-3-2 configurations. The longest seeing distances are achieved with the 2-3-4 system. The overall evaluation favored the 2-3-4 configuration. Uniform beam practices are included.

HS-800 844

5K. Maintenance And Repairs

THE ECONOMIC EFFECTIVENESS OF MANDATORY ENGINE MAINTENANCE FOR REDUCING VEHICLE EXHAUST EMISSIONS. CRC EXTENDED PHASE I STUDY. INTERIM REPORT

TRW Systems Group

For primary bibliographic entry see Fld. 5F.

HS-013 054

THE ECONOMIC EFFECTIVENESS OF MANDATORY ENGINE MAINTENANCE FOR REDUCING VEHICLE EXHAUST EMISSIONS. CRC EXTENDED PHASE I STUDY. INTERIM REPORT

TRW Systems Group

For primary bibliographic entry see Fld. 5F.

HS-013 054

COST OF OPERATING AN AUTOMOBILE

Federal Hwy. Administration

L. L. Liston C. L. Gauthier

GPO

*Vehicle operating costs, *Economic analysis, *Vehicle size, *Automobile repair costs, *Fuel costs, *Insurance costs, *Maintenance costs, *Parking costs, *Tire replacement costs, *Depreciation, *Taxation, *Tolls, *Life expectancy, *Vehicle mileage, *Compact automobiles, *Baltimore,

The estimated operating costs of a standard size, 1972 automobile, a 1972 compact car, and a 1972 subcompact automobile are presented in tabular format. The estimates cover vehicle costs for 100,000 miles of operation over a 10 year period. Total costs in dollars and costs per mile are given for repairs and maintenance, depreciation, tire replacement, accessories, gasoline, oil, insurance, parking and tolls, and state and federal fees and taxes. Assumptions made in conducting the study, bases for the estimates, and applications for the data are discussed. The Baltimore area prices, considered to be in the middle range, were used.

HS-013 086

5L. Manufacturers, Distributors, And Dealers

1972 AUTOMOBILE FACTS AND FIGURES

Motor Vehicle Manufacturers Assoc. of the United States, Inc.

Corporate author

*Automobile production statistics, *Transportation statistics, *Sales statistics, *Manufacturing, *Exhaust emission control devices, *Exhaust emission control, *Automobile design, *Quality control, *Safety devices, *Vehicle registration, *Automobile age, *Vehicle usage, *Trip length, *Trip purpose, *Driver mileage, *Vehicle mileage, *Accident statistics, *Fatality rates, *Economic analysis, *Automotive industry, *Consumer demographic data, *Marketing, *Imports, *Exports, *Taxation, *Automobile disposal, *Driver statistics Driver characteristics,

Statistics for 1971 indicate that U. S. motor vehicle factory sales included 8.6 million automobiles and over two million trucks and buses; U. S. and Canadian automobile production approached 9.7 million units; V-8 engine installation declined from 84.2% for 1970 models to 78.8; about 85% of automobiles in use had emission controls; households not owning automobiles dropped to 20%; U. S. automobile retail sales totalled 10.2 million; automobile use and purchases accounted for nine percent of U. S. personal income; the average male driver annually drives over twice as far as the average female driver; U. S. highways are safest among major nations; and motor vehicle and related industries annually account for 11.7% of manufacturing sales, 17.3% of wholesale sale, 24.4% of retail sales, and 17.1% of selected service sales. Federal automotive excise taxes totalled \$6.8 billion in 1970, and the automobile and light truck excise tax was repealed in 1971.

HS-013 042

5N. Occupant Protection

REALITIES AND HORIZONS ON CRASH SURVIVABILITY

Department of Transp.

C. Y. Warner

Presented at the 19th annual technical meeting of the Institute of Environmental Sciences, 2-5 Apr 1973, Anaheim, Calif. and published in the Proceedings.

Northwest Highway, Mt. Prospect, Ill. 60056

*Occupant protection, *Accident survivability, *Air bag restraint systems, *Restraint system tests, *Restraint system effectiveness, *Injury prevention, *Restraint system design, *Impact tests, *Front end collisions, *Reliability, *Human acceleration tolerances,

The effectiveness of active and passive restraint systems in preventing occupant injury is briefly discussed. The air bag restraint system, the best performer of all known passive systems for frontal impacts, is described. Three main advantages of the air bag restraint systems are it does not depend upon occupant action for its effectiveness; it provides adequate distribution of forces over body areas, increasing the level of severity of crashes which occupants can survive; and it utilizes the additional stopping distance which is available inside the vehicle. Potential problems of an air bag, including deployment noise, inadvertent deployment, effectiveness in multiple impacts, interface with an out of position occupant, and system reliability, are discussed and some solutions are presented. It is concluded that it is possible to resolve all of the potential disadvantages of the air bag system by proper rational design.

HS-013 027

Driver v6 n9 p8-11

*Child safety seats, *Harnesses, *Infant restraint systems, *Seat belts, *Restraint system effectiveness, *Child safety,

The effectiveness of harnesses, seat belts, child safety seats, and infant restraint systems in preventing child injuries is discussed. Child restraint equipment should distribute an impact over large areas of the child's body; sustain a static load of 1,000 pounds; attach either to the rigid car structure or to a seat belt that is anchored to the car structure; be constructed of materials free from injury-producing components such as sharp edges or hard corners; and prevent whiplash by bracing the child's head and neck.

HS-013 033

SEAT BELTS: THE AUSTRALIAN EXPERIENCE

V49 N1

Journal of American Insurance v49 n1 p29-32

*Seat belt usage laws, *Seat belt usage, *Australia, *Injury prevention, *Fatality prevention, *Legal factors, *Legal rights, *Three point restraint systems, *Passive restraint systems,

In Australia, for a 12 month period following the enactment of compulsory seat belt laws, vehicle occupant fatalities went down 23% and serious injuries declined 30%. Prior to implementation of the mandatory use laws, the Australia seat belt wearing rate was approximately 25%. Now, the rate is up to 80% in metropolitan areas and 60% in the rural areas. Arguments for and against the implementation of compulsory seat belt laws in the United States are presented. Passive restraint systems are briefly discussed as an alternative to mandatory seat belt use laws.

HS-013 036

HOW REAL-WORLD CRASHES ARE INCREASING AIR BAG ACCEPTANCE

V74 N4

J. Kietly

Traffic Safety v74 n4

*Air bag restraint systems, *Restraint system effectiveness, *Accident investigation, *Injury prevention, *Noise, *Air bag inflation pressure, *Safety device costs, *Fatality prevention, *Impact velocity, *Diagnostic equipment, *Restraint system tests,

Investigation of accidents and results of a test in which air bags prevented serious injury to automobile occupants have reduced skepticism toward air bag effectiveness. Some air bags include a built in diagnostic system which activates a warning light if any part of the air bag system is out of order. The problem of hard rebound off the the air bag has been solved by using sensors that can determine the severity of the crash and then inflate the bags only as much as necessary to cushion the occupant and prevent injury; Air bag cost estimates are presented.

HS-013 076

NOISE MECHANISMS IN THE INFLATION OF THE AUTOMOTIVE SAFETY AIR BAG

General Motors Corp.

R. Hickling J. W. Posey

Presented at the Acoustical Society of America Meeting (85th), Boston, 13 Apr 1973.

Corporate author

*Air bag inflation devices, *Noise, *Acoustic measurement, *Sound intensity, *Noise sources, *Spectral analysis, *Silencers, *Noise control, *Air bag inflation time, *Diffusers,

Free-field noise from a compressed gas air bag inflator was recorded and spectrally analyzed. Tests were run with different types of silencing devices inserted in the manifold, and with and without the bag attached. Comparisons between the noise spectra obtained in these tests permitted the identification of different mechanisms of noise generation. The largest peak in the spectrum was generally below 20 Hz and is due to a monopole-type of source associated with the overall discharge of gas from the inflator system. Other noise sources are associated with the motion of the surface of the bag, organ-pipe sources within the manifold, and broad-band jet noise associated with the flow of gas through the diffuser slots into the air bag.

HS-013 094

STRUCTURE VERIFICATION OF BUS PASSENGER SEATS. FINAL REPORT

Virginia Polytechnic Inst. and State Univ.

For primary bibliographic entry see Fld. 5B.

HS-800 871

5P. Registration

1972 AUTOMOBILE FACTS AND FIGURES

Motor Vehicle Manufacturers Assoc. of the United States, Inc.

For primary bibliographic entry see Fld. 5L.

HS-013 042

5Q. Safety Defect Control

EXPERIMENT IN ASSESSING COLOR SEPARATION TECHNIQUES FOR IDENTIFYING SMALL DENSITY VARIATIONS IN TIRES. INTERIM REPORT

Department of Transp., Transp. Systems Center

For primary bibliographic entry see Fld. 5V.

HS-820 241

5R. Steering Control Systems

EFFECTS OF TIRE SLIP ON THE HANDLING PERFORMANCE OF TRACTOR SEMITRAILERS IN BRAKING MANEUVERS

Michigan Univ. Hwy. Safety Res. Inst.

Presented at International Automotive Engineering Congress, Detroit, 8-12 Jan 1972.
SAE

*Mathematical models, *Tire slip motion, *Vehicle handling, *Tractor semitrailers, *Vehicle stability, *Braking, *Coulomb friction, *King pins, *Automatic brakes,

Automatic braking control systems for trucks and tractor semitrailers have become the subject of a sizeable research and development effort. These devices can provide improved vehicle stability and control characteristics in braking maneuvers. An analysis utilizing a mathematical model of a tractor semitrailer vehicle yielded the following results: favorable stability and control characteristics in braking maneuvers are maintained when front wheels do not lock, tractor rear wheel longitudinal slip remains less than front wheel longitudinal slip, and semitrailer rear wheels do not lock. Effects of kingpin (fifth wheel) location and introduction of coulomb friction at the kingpin are also discussed.

HS-013 066

ACCIDENT AVOIDANCE EVALUATION OF GENERAL MOTORS EXPERIMENTAL SAFETY VEHICLE. FINAL REPORT

Dynamic Science

For primary bibliographic entry see Fld. 5A.

HS-800 854

SAFETY OF WIDE BUSES. SUMMARY REPORT

National Hwy. Traf. Safety Administration

For primary bibliographic entry see Fld. 5B.

HS-820 265

5T. Trucks And Trailers

TRUCK NOISE--MEASUREMENTS AND CORRELATION TO INDUSTRY AND LAW ENFORCEMENT STANDARDS

McDonnell Douglas Astronautics Co.

For primary bibliographic entry see Fld. 2G.

HS-013 029

MOTOR CARRIER SAFETY REGULATIONS

Bureau of Motor Carrier Safety

For primary bibliographic entry see Fld. 4A.

HS-013 068

TRAILER BRAKING PERFORMANCE-- RECREATIONAL VEHICLES. FINAL REPORT

Dynamic Science

For primary bibliographic entry see Fld. 5A.

HS-800 837

5V. Wheel Systems

AN EVALUATION OF SOME UNBRAKED TIRE CORNERING FORCE CHARACTERISTICS

Langley Res. Center

T. J. W. Leland NASA-TN-D-6964; L-83

NTIS

surface texture, *Cornering, *Tire tread patterns, *Hydroplaning, *Tire traction, *Tire tests, *Test facilities, *Tire test equipment, *Dry road conditions, *Wet road conditions,

An investigation to determine the effects of pavement surface condition on the cornering forces developed by a group of 6.50 X 13 automobile tires of different tread design was conducted. The tests were made at fixed yaw angles of 3 degrees, 4.5 degrees, and 6 degrees at forward speeds up to 80 knots on two concrete surfaces of different texture under dry, damp, and flooded conditions. The results showed that the cornering forces were extremely sensitive to tread pattern and runway surface texture under all conditions and that under flooded conditions tire hydroplaning and complete loss of cornering force occurred at a forward velocity predicted from an existing formula based on tire inflation pressure. Further, tests on the damp concrete with a smooth tire and a four-groove tire showed higher cornering forces at a yaw angle of 3 degrees than at 4.5 degrees; this indicated that maximum cornering forces are developed at extremely small steering angles under these conditions.

HS-013 038

A TEMPERATURE STUDY OF PNEUMATIC TIRES DURING HIGHWAY OPERATION. FINAL REPORT

Army Tank-Automotive Command

D. K. Wilburn TR-11716; AD-755 817

NTIS

*Pneumatic tires, *Tire temperature tests, *Road tests, *Tire temperature, *Operating temperature, *Temperature endurance tests, *Instrumented vehicles, *Road surfaces, *Bias belted tires, *Tire ply number, *Tire defects, *Tire wear, *Dynamometers, *Drums, *Tire loads, *Tire inflation pressure, *Camber, *Air flow, *Infrared analyzers, *Tire sidewalls, *Tire treads, *Sensors, *Speed, *Economic analysis, *Tire performance, *Tire balancing,

Pneumatic tire and road surface temperatures are measured using infrared sensory non-contact techniques. A test vehicle implemented with dual system temperature averaging and high speed circumferential profiling instrumentation is described. Infrared techniques for generating tire temperature histories are discussed in terms of highway performance. The influence of road surface, air temperature, air flow, and solar load are shown. Circumferential high resolution temperature profiles are plotted for defect induced tires relative to sensing the development and location of the defect under actual highway conditions. Average tread and sidewall temperatures are plotted for new and worn two- and four-ply bias belted tires for variations of load, speed, inflation, balance, and camber. A comparison is made between temperatures generated in tires operated under highway conditions and the same tire run on the dynamometer drum tester. Results are based on approximately 5000 miles of highway testing of 10 test tires of various types.

HS-013 083

HOW TIRES WEAR

V81 N5

Based on New Concepts of Tire Wear Measurement and Analysis, SAE-730615, by W. Bergman and W. B. Crum.
Automotive Engineering v81 n5 p27-36

Group 5V—Wheel Systems

*Tire wear, *Mathematical analysis, *Tire treads, *Tire traction, *Tire pavement interface, *Tire road conditions, *Friction, *Pavement surface texture, *Abrasion, *Wheel slip, *Tire mechanics, *Cornering, *Tire deflection, *Tire road contact forces, *Acceleration, *Braking, *Tire wear measurement, *Tire properties, *Fatigue (materials), *Thermal degradation, *Ford Motor Co., *Adhesion,

Ford Motor Co. researchers have developed an analysis of tire tread wear based on new techniques. This basic guide describes the nature of grip and friction, the role of pavement surface texture, and the mechanics of abrasive tread wear. A mathematical approach for predicting tread wear for a wide variety of materials, constructions, and operating conditions is also presented.
HS-013 088

EXPERIMENT IN ASSESSING COLOR SEPARATION TECHNIQUES FOR IDENTIFYING SMALL DENSITY VARIATIONS IN TIRES. INTERIM REPORT

Department of Transp., Transp. Systems Center
S. N. Bobo DOT-TSC-NHTSA-72-2
Contract HS-303
NTIS

*Tire defects, *Tire inspection, *X ray diffraction, *Brightness, *Color, *Fluoroscopy,

An experimental color system was tested as an adjunct to the X ray fluoroscopy system already in use for tire inspection. Shades of gray were translated into various colors as a means of enhancing small defects normally observed with difficulty, and to provide for more rapid identification of gross defects.
HS-820 241

HS-013 094	26
HS-013 095	5N
HS-238-4-11-11 AIL-	28
HS-R00 844	1C
HS-R00 782	5J
HS-R00 835	5J
HS-R00 837	5A
HS-R00 844	5J
HS-R00 845	1C
HS-R00 854	5A
HS-R00 867	3D
HS-R00 871	5R
HS-R20 241	5R
HS-R20 265	5R
WFF-R00-1970	1C
HS-R00 782	1C
NASA-TN-D-69641 L-83	
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NTSB-NAP-73-21 SS-H	1C
HS-013 035	2C
PR-204 660 660	1C
HS-013 053	1C
RR-40	
HS-013 081	
SAE-770902	3F
HS-013 095	
SAE-730020	2G
HS-013 055	
SAE-730024	5D
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HS-013 057	5D
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HS-013 058	5D
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